JPRS 79017

21 September 1981

USSR Report

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 86

FBIS FOREIGN BROADCAST INFORMATION SERVICE

NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

JPRS 79017

21 September 1981

USSR REPORT

ELECTRONICS AND ELECTRICAL ENGINEERING

No. 86

CONTENTS

AMPLIFIERS

Complex Semiconductor Device for Controlling Electron Drives of Industrial Mechanisms.. 1

Calculating Conditions of Amplifier of Modulated Oscillations According to the Real Characteristics of the Tubes Used......... 1

Wide-Band Power Amplifiers Using KT913 and KT916 Transistors...... 2

ANTENNAS

Regularized Method of Adaptive Optimization of Filters With Respect to the Criterion of Maximum Signal-to-Interference Ratio.. 3

Effect of Lateral Radiation of Antennas on Their Intercoupling.... 4

Field in Antenna Aperture and Noise Temperature of Reflector-Type Antenna.. 4

Analyzing Statistical Characteristics of Directive Gain of Phased Antenna Array With Random Amplitudes, Phases and Arrangement of the Radiators.................................. 5

CERTAIN ASPECTS OF COMPUTER HARD AND SOFT WARE: CONTROL, AUTOMATION, TELEMECHANICS, TELEMETERING, MACHINE DESIGNING AND PLANNING

Device for Automatic Control of Photodetector Sensitivity......... 6

Modelling of Methods for Electric Drive Control of Equipment for Precise Magnetic Recording.. 6

Telemetering Electrical Energy and Average Power in Power Systems.. 7

Potentialities of Data Teleprocessing by a Unified Electronic Computer System.. 8

Telemetering System.. 8

CERTAIN ASPECTS OF PHOTOGRAPHY, MOTION PICTURES AND TELEVISION

Operational Amplifiers in Horizontal Sweep Generators for Transmitting Cameras.. 9

Evaluating Characteristics of Photoelectric Transducers in the Case of Spatial Digitization of Video Images.................... 10

Multiplexing Television Channels With Telegraph Communication..... 10

Calculating Television Relay Station Service Area................. 11

Solid State Television Cameras With Internal Color Separation..... 12

Small-Size Pancratic Telescope With a Camera...................... 12

CERTAIN ASPECTS OF RADIOASTRONOMY, SATELLITES AND SPACE VEHICLES

Refraction Effects in the Venus Atmosphere From Bistatic Radar Data.. 14

Comparison of Clock-Pulse Synchronization Devices................. 15

COMMUNICATIONS, COMMUNICATION EQUIPMENT, RECEIVERS AND TRANSMITTERS, NETWORKS, RADIO PHYSICS, DATA TRANSMISSION AND PROCESSING, INFORMATION THEORY

Spatial Information Carrying Capacity of Optical Isoplanar Channel for Information Transmission............................ 16

Effect of Refractive Index Fluctuation on Weakening of a Field in a Tropospheric Waveguide.................................... 16

Variation of Lower Ionosphere Parameters Under the Effect of Powerful Radio-Frequency Radiation.............................. 17

Evaluating Electromagnetic Shield Efficiency...................... 18

State of the Art in Optical-Cable Communication Systems Technology.. 18

Crosstalk Between Optical Fibers During Paucimodal Transmission... 19

Transmission Parameters of Ground Wire of Single-Wire Underground Lines in Two-Layer Ground.................................. 20

Three-Phase Insulated Cable Line With Asymmetrical Arrangement of Phase.......... 20

Requirements on Coefficient of Protective Action for Metal Sheathing of Coaxial Cable With Effect of High-Voltage Line..... 21

Automatic System for Measuring Microwave Radio Network Characteristics.......... 21

Statistical Characteristics of Rapid Phase Fluctuations of Centimeter Waves Beyond the Horizon.......... 22

Constructing Computing Systems in Communication Sector.......... 22

Radio Wave Refraction by Artificial Disturbances of the Ionosphere: a Numerical Experiment.......... 23

Depth of Noise Suppression in the Heterodyne of Millimeter Wave Receiver With the Aid of Zehnder-Mach Interferometer.......... 24

Electrical Characteristics of Corrugated Coaxial Cables.......... 24

Linear Rate of IKM-15 Digital Transmission System.......... 25

Effect of Intersymbol Distortions on Information Transmission Over Optical Cable Lines.......... 25

Rapid Calculation of Ambiguity Function of Frequency-Shift Keying Signals.......... 26

Detecting Faults in Quasi-Ternary Signals.......... 26

Errors of Multidimensional Identification of Ionosphere Parameters in the Method of Noncoherent Scattering.......... 27

Automatic Device With Continuous Set of Conditions for Detection of Weak Fluctuating Signals.......... 28

Interpolational Method of Shaping Narrow-Band Signals.......... 28

Statistical Evaluation of Signal Detection Characteristics in Pulse Location Systems.......... 29

Detecting and Analyzing Pseudorandom Phase Shift Keying Signals With a Priori Uncertainty.......... 29

Phase Statistical Characteristics of Optical Signal Power Fluctuations in Atmospheric Communication Channel.......... 30

Time Lag Between Signals of Individual Beams on Short-Wave Radio Communication Paths.......... 30

Noise Immunity of Frequency and Relative Phase-Shift Keying Under Conditions of Limited Bandwidth and With Peak Signal Power.................. 31

Asymptotic Efficiency of Adaptive Iterative Algorithms for Signal-to-Noise Optimization Under Nonstationary Conditions..... 32

Optimum Estimate of the Phase of a Signal With Spaced Reception... 33

Possibility of Using the Holographic Method for Processing Wide-Band Signals at Increased Frequency........................ 33

Multiplexer for Transmission of Plesiochronous Signals Over Communication Channels.................................. 34

Design of Transmultiplexer Structures............................. 35

Some Problems in Developing the Unified Automated Communication System.. 35

Continuous Control of Radiated Power of Transmitter in Radio Line With Signal Fading.................................. 36

Superheterodyne Receiver With Combined Preselector................ 37

Interference Immunity of Multidigital Discrete-Data Transmission System With Digital Processing of Signals...................... 37

Equipment for Automatic Checking of Long-Distance Automatic Telephone Communications Channels........................... 38

Forecasting Development of Communication Sectors in the Czechoslovakian Socialist Republic............................ 39

Protection From Industrial Radio Interference..................... 39

Protecting Transmission Systems................................... 40

New Price System at Radio Communications, Radio Broadcasting and Television Production Enterprises........................... 41

COMPONENTS AND CIRCUIT ELEMENTS, WAVEGUIDES, CAVITY RESONATORS AND FILTERS

Narrow-Band Matched Surface Acoustic Wave Filters With Reflectors... 42

Producing "Reverse Grids" for Filters Used in the Long-Wave Infrared Region of the Spectrum................................ 42

Taking Account of Losses in Elements of Tuned Filters of Valve Converters.. 43

Realizing Digital Filter Without Operation of Explicit Multiplication.. 44

Effect of Technological Errors on Characteristics of Surface Acoustic Wave Bandpass Filters.. 44

Synthesizing Complex Space-Frequency Filters for a Coherent-Optical Processor.. 45

Possibilities of Employing Probabilistic Rounding in Digital Filters.. 45

High-Power Semiconductor Switch on Nanosecond Band Controllable by Light Pulse.. 46

Calculating Parameters of Mifistor Devices........................ 46

Magneto-Controlled Sealed-Contact Reed Relays With Elastic Ferromagnetic Elements.. 47

Radiation Losses From Defects of Mating of Two Different Dielectric Stripline Waveguides in the Millimeter Waveband...... 48

Effect of Composition of an SF_6-Nitrogen Mixture on Switching Time of Arrester in the Nanosecond Range........................ 48

CONFERENCES, SEMINARS, EXHIBITIONS, SYMPOSIUMS

Scientific Conference-Seminar of Higher Educational Institutions on Problems of Functional Microelectronics......... 50

Scientific-Technical Seminar "Elements With Negative Resistance in Radio Receiving Equipment".. 51

Second All-Union Symposium "Nonlinear Distortions in Receiving-Amplifying Devices".. 51

CONVERTERS, INVERTERS, TRANSDUCERS

Technology for Producing Surface Acoustic Wave Transducer by Engraving Polymer Films.. 52

Designing Precision Converters With Programmed Form of Output Voltage.. 53

Noncontact Interrupter of Breakdown Current of Thyristorized Inverter.. 53

CRYOGENICS AND SUPERCONDUCTIVITY

Calculating Magnetic Field Near a Doubly-Connected Axially Symmetric Superconducting Body.................................... 55

Device for Automatic Recording of Dependence of a Current Through a Superconductor on the Magnitude of the External Magnetic Field.. 55

ELECTRICAL ENGINEERING EQUIPMENT AND MACHINERY: APPLICATIONS AND THEORY

Discharge Voltages of Noncorona Air Gaps of Different Configuration at High Frequency.................................. 57

Anti-Parallel Velocity Correction of Electromechanical Systems.... 58

Prospects for Developing Electrical Machines With Printed and Stamped Windings.. 58

Measuring Fluctuations of the Angular Speed of Electric Motors.... 59

Piezoelectric Motor.. 60

Reduced Moment of Inertia of Electric Motor With Disk Rolling Rotor.. 60

Effect of Eccentric Position of Rotor and Asymmetry of Phase Currents on Magnetic Vibration of Stator Core................... 61

Composite Construction on Basis of Polyurethane Foam and Fiber Glass for External Insulation of High-Voltage Equipment......... 61

Electric Power Quality of Airborne Electrical Supply Systems and Ways To Improve It... 62

Preventing Condensation of Moisture in Elegas Electrical Equipment... 63

Experimental Investigation of Electromagnetic Parameters of Current-Carrying Coils of Narrow Steel Strip................... 63

ELECTROACOUSTICS

Measuring Sensitivity of Acoustic Receivers in Damped Measuring Volume.. 65

Representation of Loaded Piezoelectric Plate by Simplified Equivalent Circuit.. 65

ELECTROMAGNETIC WAVE PROPAGATION, ELECTRODYNAMICS

Magnetic Field of Cylindrical Current Layer...................... 67

Thin-Walled Conducting Cylinder in Variable Field of Two-Wire Line... 67

Calculating Electromagnetic Field of Shielded Conductors in Transient Conditions... 68

Thermal Distortions of Laser Beam in the Atmosphere.............. 68

ENERGY SOURCES

Investigating Thermal Mechanism of Interelectrode Breakdown in Magnetohydrodynamic Generators.................................. 70

INFRARED

Infrared Imager for Investigating Earth's Natural Resources....... 71

INSTRUMENTS, MEASURING DEVICES AND TESTERS, METHODS OF MEASURING, GENERAL EXPERIMENTAL TECHNIQUES

Investigation by Ellipsometer Method of Surface Optical Materials After Mechanical Processing.................................. 72

Increasing Precision of Measurements With Iterative Error Correction... 73

Maximum Permissible Error of Reproduction and Transfer of Unit Size of Absorbed Neutron Radiation Dose........................ 73

Metrological Provision for Measuring Electromotive Parameters of High-Frequency and Microwave Materials in CEMA Nations....... 74

Measuring Volume Resistance of Dielectrics During Pulsed Gamma-Neutron Irradiation.................................... 74

Estimating Physical-Chemical Parameters of Surface Waters of Water Areas With Respect to Microwave Self-Radiation............ 75

Measuring Wavelength of Highly-Stable Lasers..................... 75

Wideband Frequency-Modulated Polarization Interferometers......... 76

Fabry-Perot Interferometer With Spherical Surface Adjustment...... 76

Measuring Laser Wavelength With Fizeau Interferometer............ 77

Table-Top Electric Clocks With Radio Controlled Time Correction and Piezoelectric Motor........................... 77

Dynamic Errors of SF-8 Spectrophotometer.......................... 78

MICROELECTRONICS

Electromagnetic Wave Dispersion in Some Types of Lines for Microwave Integrated Circuits................................... 79

Statistical Analysis of Hybrid Integrated Circuits of Balanced Microwave Band Amplifiers.................................... 79

Checking Defects of Internal Insulation of Elements of Integrated Circuits With the Aid of Liquid Crystals............ 80

Two-Channel Device With Charge Coupling.......................... 81

Prospects for High-Speed Bipolar Integrated Circuits............. 81

Choosing Integrated Circuits for Devices for Digital Processing of Signals.. 82

Classifying Structures of Active Elements of Bipolar Integrated Microcircuits... 83

Emitter-Function Logic Systems as Elementary Base for Large-Scale Integration With Maximum High-Speed Responses............ 83

OPTOELECTRONICS, QUASI-OPTICAL DEVICES

Calibration Modulator of Light Flux for Certification of Time-Measuring Optoelectronic Devices.......................... 85

Optical System for Fourier Recording and Processing of Information.. 85

Coordinate-Sensitive Pyroelectric Radiation Detector............. 86

Relationship Between Ergonomic and Precision Indicators for Guidance Process in Optical Devices........................... 86

Polarization Properties of Corner Reflectors..................... 87

Antireflecting Coatings for Glassy Chalcogenides in the Visible and Infrared Region of the Spectrum.......................... 88

Improving Stability of the Static Characteristic of an Optoelectronic Angular Deflection Sensor..................... 88

Increasing Reliability of Soldered Connections in Optoelectronic Units.. 89

Fungicide Compounds and Coatings Created on Their Base for Aluminized Mirrors.. 90

Automating Process of Deposition of Interference Coatings on Optical Units.. 90

OSCILLATORS, MODULATORS, GENERATORS

Frequency Stabilization of Ensemble of Self-Excited Oscillators.. 92

Surface Acoustic Waves Oscillator Using Integral Thermostat....... 93

PHOTOELECTRIC PHENOMENA AND DEVICES, ELECTROLUMINESCENCE, ION DEVICES

Choice of Clear Aperture of Optics of Photodetector Operating in Subsurface Regime.. 94

Investigating Nonlinear Distortions of Photoresistors in Low-Frequency Regions.. 94

Determining Spectral Characteristics of Nonlinear Photodetectors.. 95

POWER SYSTEMS (INCLUDING EFFECT OF VARIOUS ITEMS ON POWER TRANSMISSION)

Investigating Processes of Development of Lightning Surges on Electrical Equipment During Placing of Protective Gaps on Approaches to Substation.. 96

PRODUCTION TECHNOLOGY

Laser Treatment in Manufacture of Precision GIS Thin-Film Resistors.. 97

Improving Technological Process for Mass Producing Cadmium Sulfide Photoconductive Cells.. 97

PULSE TECHNIQUES

Measuring Moments of Poisson Pulse Random Process................. 98

Parametric Identification of Pulses Devices With Lumped Parameters.. 99

Change of Form of FEU-83 Single-Electron Distribution of Pulses During Measurements in Wide Spectral Range..................... 99

QUANTUM ELECTRONICS

Small-Sized Single-Mode Carbon Dioxide Laser.......................... 101

Corner Genetic Functions for Synthesizing Contour Images at Output of Holographic Correlators.............................. 102

RADARS, RADIONAVIGATION AIDS, DIRECTION FINDING, GYROS

Realizing Subsurface Sounding of Stratified Earth Covers Using Coherent Radar With Doppler Filtration........................ 103

Statistical Characteristics of Field Dispersed by Distributed Objects to Nearby Radar.................................... 104

RECORDERS

Three-Dimensional Recording Field and Fringe Effect of Magnetic Head.. 105

Carbide-Silicon Light-Emitting Diodes in Photorecording Devices... 106

SEMICONDUCTORS AND DIELECTRICS, CRYSTALS IN GENERAL

Process of Forming Thin-Film System Metal-Dielectric-Metal........ 107

Mechanisms of Conductivity of Silicon Nitride in Metal-Insulator-Semiconductor Structures.............................. 108

Gunn Diode Microwave Mixer.. 108

Features of Laser Annealing in Ion-Implanted Specimens of Silicon With Effect of Conditions on Surface.......................... 109

Measuring Phase Stability of Radio Pulse Gunn-Diode Oscillators... 109

Model of Metal Insulated Gate Field Effect Transistor With Bulk Channel... 110

Charge State of Dielectric in Structure Gallium Arsenide--Anode Oxide... 111

Frequency Properties of Gunn-Diode Mixers in Millimeter Band...... 111

Choice of Initial Approximation to Numerical Analysis of Bipolar Semiconductor Devices.................................... 112

Group Method of Producing Diode Structures........................ 112

VARIOUS MISCELLANEOUS ITEMS, INCLUDING THEORIES

Probabilities of Discrimination Errors of Two Processes With Random Intensities.. 114

AMPLIFIERS

UDC 621.314.6.072.2:083.75.001.4

COMPLEX SEMICONDUCTOR DEVICE FOR CONTROLLING ELECTRON DRIVES OF INDUSTRIAL MECHANISMS

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 81 (manuscript received 8 Apr 80) pp 54-56

KUTLER, N. P., BRAGILEVSKIY, Ye. L., engineers, ZAVADSKIY, Yu. Ye., candidate of technical science, GRUDNEV, V. G., KOVAL', A. A., engineers

[Abstract] VNIIElektroprivod (All-Union Scientific-Research and Planning-Design Institute for Automated Electric Drive in Industry, Agriculture and Transport), together with SKTBPT (Special Design and Technological Office PT [expansion unknown]), Stavropol', on the base of the new power optron thyristors of Types TO2-40 and TO-10, developed and introduced into series production a number of linear semiconductor amplifiers of Type UPL-1. (G. A. Antonov and V. I. Kuznetsova took part in the development.) The amplifiers serve as the base of unified devices, intended for the construction of circuits for electric drives of wide applications, as well as stabilizers of the average value of rectified voltage and current. The conditional designation, performance (reverse or nonreverse) and parameters of the amplifiers are presented. Figures 2. [317-6415]

UDC 621.375.001.24:621.396.61

CALCULATING CONDITIONS OF AMPLIFIER OF MODULATED OSCILLATIONS ACCORDING TO THE REAL CHARACTERISTICS OF THE TUBES USED

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 10 Dec 79) pp 43-48

ROZOV, V. M. and FAN GYU GUAN

[Abstract] The contemporary engineering method of calculating power high-frequency amplifiers of modulated oscillations (AMO) is based on idealization of the characteristics of the tubes. However, this method does not provide for an analysis of nonlinear distortions (ND), even though this parameter of an AMO is

most sensitive to any nonlinearity of the steady state of the tubes. Various methods have been proposed for calculation of the ND in the AMO, but as a rule they are approximate and give considerable errors during calculation of AMO based on contemporary power tetrodes. The present paper describes in detail a method of calculation of the conditions of an AMO according to the real characteristics of the tube used. An algorithm is formulated by which a program is composed for calculating the conditions of an AMO by a Minsk-32 computer. A block diagram of this program is presented. It is concluded that the results of the work show that calculations of the parameters of an AMO is possible with a precision sufficient for practice. It is evident that the method can successfully be used in the practice of planning radio devices. It appears that one of the means of using this method (at any rate for power tubes of transmitters with single-band modulation) could be to provide machine calculation of parameters if only for the nominal condition of each of the tubes produced at a plant, and using some of these parameters in certification of tubes. Figures 6; tables 1; references: 4 Russian.
[313-6415]

UDC 621.375.421.029

WIDE-BAND POWER AMPLIFIERS USING KT913 AND KT916 TRANSISTORS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
No 3, Mar 81 (manuscript received 11 Nov 79) pp 86-87

GOVORUKHIN, V. I., IVLEV, B. I., KERBERG, V. V. and MAKOGON, V. M.

[Abstract] The basic and topological circuits and the technical characteristics are presented for a family of wide-band, single-stage amplifiers using KT913 and KT916 transistors, which are intended for amplification of the power of narrow-band and wide-band signals up to the level of 6-8 and 15-20 W in the frequency range 300-500 and 450-750 MHz with a gain of 7-10 dB and an efficiency greater than 50%. These wide-band amplifiers can be used as amplifiers of the units of wide-range radio transmitting devices, the equipment of medical and industrial electronics and in instruments and systems for professional purposes. Figures 2; tables 1; references: 2 Russian.
[268-6415]

ANTENNAS

UDC 621.372:621.391.82

REGULARIZED METHOD OF ADAPTIVE OPTIMIZATION OF FILTERS WITH RESPECT TO THE CRITERION OF MAXIMUM SIGNAL-TO-INTERFERENCE RATIO

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 29 Jan 79) pp 543-551

ABRAMOVICH, Yu. I.

[Abstract] The relationship between the efficiency of adaptive adjustment of an antenna array with respect to the maximum signal-to-interference ratio and the bulk instruction sample is investigated. The weight vector $\hat{W}_T$ of the array is used, which was obtained as the result of transformation of the estimate of the correlation matrix $\hat{W}_T = \hat{D}_T^{-1}$ Sn where $\hat{W}_T$ is the N-dimensional vector of the complex envelope of a spatial filter (of the antenna array); Sn in the N-dimensional vector which is determined by the form (direction of arrival) of a valid signal. It is shown that regularization of the estimate of the correlation matrix by means of the addition of a diagonal unit matrix makes it possible to use the transformation method with an arbitrary bulk instruction sample while the effective noise suppression occurs with a bulk instruction sample equal to the amount of the effective interference. Numerical characteristics and the law of distribution of a sample coefficient of losses are obtained. The results are presented of a mathematical simulation of the process of adaptive adjustment of a weight vector for a 10-element antenna arrry with the effect of four types of interference. The simulation confirms the basic conclusions. Figures 1; references 10: 7 Russian, 3 Western.
[324-6415]

UDC 621.396.67

EFFECT OF LATERAL RADIATION OF ANTENNAS ON THEIR INTERCOUPLING

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81
(manuscript received after completion 5 Nov 80) pp 59-62

BLEDNOV, V. I. and KOVANOV, L. V.

[Abstract] The presence of side lobes makes impossible an approximation of a radiation pattern by one trigonometrical function of the form $\cos^m \theta$. For an approximate determination of the intercoupling of such antennas an approximating function of the form

$$F\ \theta = R\cos^p\theta + (1-R)\cos^q\theta \quad (0 \leq \theta \leq \frac{}{2})$$

where p,q are positive numbers, was found by the method of least squares. The coefficient of intercoupling is obtained by means of this function. The proposed method of calculating intercoupling is asymptotic and can be used only with sufficiently large distances between antennas when the condition of their arrangement in the far zone is fulfilled. Figures 4; references 6: 4 Russian, 2 Western (in translation).
[325-6415]

UDC 621.396.677

FIELD IN ANTENNA APERTURE AND NOISE TEMPERATURE OF REFLECTOR-TYPE ANTENNA

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 2 Oct 78)
pp 28-32

SOMOV, A. M.

[Abstract] Reflector-type antennas are widely used as terrestial antennas for communication links with satellites. The necessity of increasing the energy capabilities of such lines and expansion of the service zone is responsible for the use of antennas of middle and small dimensions, operating at a small angle of inclination to the horizon. The quality of the signal at the output of the system substantially depends on the noise temperature of the antenna, which is determined by the directional properties of the antenna, its active losses and the effective noise temperature of the environment. The dependence of the noise temperature of the earth station on the distribution of the field in an antenna aperture is of importance. Although the distribution does not give a complete representation concerning the directional diagram of antennas because it does not take account of the scattering field of an exciter and other effects, it is possible to study the dependence of the noise temperature on the form of the distribution for various physical conditions. Investigation of such dependence, taking account of the range of operating frequencies, the angle of inclination

of the antenna to the horizon, the relative dimension of the basic reflector-type as well as the physical properties of the underlying surface is considered in the present paper. A graph is presented of the dependence of the noise temperature of a KTNA-200 antenna with a diameter of 25 m in the 4 GHz band for $\epsilon = 3.5$ on the angle of inclination to the horizon, calculated with the aid of two expressions derived in the paper and a completed directional diagram, measured on a model, as well as the results of measurement of the noise temperature conducted on one of the copies of the antenna. Figures 11; references 4: 3 Russian, 1 Western.
[313-6415]

UDC 621.396.677.012.12

ANALYZING STATISTICAL CHARACTERISTICS OF DIRECTIVE GAIN OF PHASED ANTENNA ARRAY WITH RANDOM AMPLITUDES, PHASES AND ARRANGEMENT OF THE RADIATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 18 Jan 80) pp 524-531

STEBLIN, V. I. and KLASSEN, V. I.

[Abstract] A method is proposed for analysis of the statistical characteristics of the directive gain with a large phased antenna array, arbitrary amplitude-phase distortions and nonequidistant arrangement of the radiators, which makes it possible fairly simply to calculate the general asymptotic (with reference to 1/N) expression for $\overline{D}$ and δ_D^2 which agree with the results of special cases considered earlier. The results of numerical calculations are presented. The authors thank V. V. Merkulova for helpful consultations. Figures 4; tables 1; references: 8 Russian.
[324-6415]

CERTAIN ASPECTS OF COMPUTER HARD AND SOFT WARE: CONTROL, AUTOMATION, TELEMECHANICS, TELEMETERING, MACHINE DESIGNING AND PLANNING

UDC 621.3.08

DEVICE FOR AUTOMATIC CONTROL OF PHOTODETECTOR SENSITIVITY

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81 (manuscript received 25 Mar 80) pp 38-40

REPINSKIY, Ye. K. and FEDOROV, L. N.

[Abstract] Circuits for automatic control of photodetector sensitivity, as a function of the signal magnitude, are especially necessary in conducting maritime studies when, because of a large value of the attenuation factor and the transmission selectivity of the medium, the luminous flux decreases sufficiently rapidly with an increase of the depth of immersion. In the present paper studies are made which demonstrate that use of a transistor controlled voltage divider for a photomultiplier considerably expands the range of automatic control of sensitivity. The sensitivity of a photodetector, for example, was changed by nine orders of magnitude with the inauguration of only five transistors. Change of the signal level on the load does not exceed ±1.5%.
[298-6415]

UDC 621.314.14.001.5

MODELLING OF METHODS FOR ELECTRIC DRIVE CONTROL OF EQUIPMENT FOR PRECISE MAGNETIC RECORDING

Kiev TEKHNICHESKAYA ELEKTRODINAMIKA in Russian No 5, Sep-Oct 80 (manuscript received 24 Dec 79) pp 76-81

DENISOV, A. I., BIZIKOV, V. A., SIRENKO, S. M., KABYSHEV, A. M., MEZHERITSKIY, V. A. and SAVCHUK, V. P., Northern Caucasian Mining-Metallurgical Institute, Ordzhonikidze

[Abstract] Methods of control of a synchronous motor are studied on the basis of modelling and experiments. The results of modelling the qualitative characteristics of a system of automatic control are shown for the following methods: frequency-phase, torque and torque in a noncontact d-c motor. The experimental

data qualitatively confirmed the accuracy of results with respect to electronic modelling. As for the quantitative results, there is some difference here between the experimental data and the modelling results. The overall results obtained make it possible to consider the frequency-phase method to be the most promising and advisable for use in the electric drive of equipment for precise magnetic recording, as well as the torque method with use of a synchronous motor [illegible] a noncontact d-c motor regime. Figures 6; tables 1; references: 4 Russian.
[277-6415]

UDC 621.311.083.72

TELEMETERING ELECTRICAL ENERGY AND AVERAGE POWER IN POWER SYSTEMS

Moscow ELEKTRICHESTVO in Russian No 6, Jun 81 (manuscript received 15 Mar 79) pp 2-6

BOGDANOV, V. A., TsDU (Central Dispatching of the Integrated Power Systems of Socialist Countries), YeEs (Unified Power System), USSR

[Abstract] The author considers the organization of telemetering increases of electrical energy and the average power with the aid of electronic counters of electrical power, with a pulse output; additional conjugate units; and available multichannel pulse-code teleautomatics devices; channels of communication; and computing techniques facilities for an automatic system of dispatcher control. Each of these units is discussed and explained. In the next years all the largest electrical stations, intersystems and interstate connections plan to accomplish a calculation of active and reactive electric power with the assistance of electronic counters. V. M. Chizhkov, S. S. Raksheyev and U. K. Kurbangaliyev, coworkers of the Central Dispatching of the Integrated Power Systems of Socialist Countries, Unified Power System, USSR, took part in development of the conjugate units. The codes used in contemporary teleautomatics devices assure a sufficiently high level of protection of the information transmitted, from interference in the channel and make it possible not only to detect but in a number of cases to rectify occuring distortions. References: 3 Russian.
[318-6415]

UDC 656.25-52

POTENTIALITIES OF DATA TELEPROCESSING BY A UNIFIED ELECTRONIC COMPUTER SYSTEM

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 4, Apr 81 pp 12-16

VOROBE'YEV, A. G., group chief of PKTB ASUZhT (Planning and Design Technological Bureau; Automated System of Control of Railroad Transportation), and RATIN, G. S., senior scientific-research worker, VNIIZhT (All-Union Order of the Red Banner of Labor Scientific-Research Institute of Railroad Transportation)

[Abstract] At present, USSR industries and enterprises of CEMA countries are beginning series output of multiplexers for data transfer (MDT) intended for organization of a union of remote users of a data processing system with computer complexes of networks constructed on the basis of models of a unified system of electronic computers. The types of MDT produced in the USSR, GDR, Bulgaria and Hungary are listed. Production is also beginning of the programable MDT or the so-called data teleprocessor (DTP), the types of which are also listed. These devices are intended for replacement of the MDT now being used and for reduction of utilization of the basic machines, as well as for organization of computer networks with the use of DTP as a linked processor in a complex with a unified system of electronic computers. The principal characteristics of the various MDT in production are presented. A detailed description of the MDT is furnished, along with comments on one of its shortcomings. Figures 5; tables 1.
[315-6415]

TELEMETERING SYSTEM

Moscow VESTNIK SVYAZI in Russian No 3, Mar 81 pp 25-27

LAKERNIK, A. I. and SHPERLIN'SH, I. A., senior engineers of Laboratory of the Republic Network of Radio Broadcasting, Radio Communication and Television, LaSSR Ministry of Communications

[Abstract] Lately automatic digital control and measuring devices find increasingly wide application in television channels. Their effectiveness increases with centralization of control with the use of telemetering equipment and the documentary fixing of the information obtained. Signal persons of the LaSSR organized operation of a test section of a television network with centralized management and control. For the test section there was developed a digital and tolerance telemetering system for data transfer by a standard nonswitched telegraph channel organized in the group spectrum of the telephone broad-band channel of a republic radio relay line. The following items are discussed in some detail: 1) Generalized block diagram of a telemetering system; 2) Block diagram of telemetering transmitter; 3) Diagrams illustrating the operation of the transmitter; 4) Block diagram of telemetering receiver; and 5) Block diagram of an element for representation of information. The merits of the telemetering system are examined.
[322-6415]

CERTAIN ASPECTS OF PHOTOGRAPHY, MOTION PICTURES AND TELEVISION

UDC 621.373.144.1:621.375.087.9

OPERATIONAL AMPLIFIERS IN HORIZONTAL SWEEP GENERATORS FOR TRANSMITTING CAMERAS

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 2, Feb 81 pp 36-38

AZIMOV, Ye. I. and KURKOV, I. N., All-Union Scientific Research Institute for Television and Radio Broadcasting

[Abstract] When horizontal sweep generators for color TV cameras are designed in a linear voltage-current conversion configuration around an operational amplifier, it is necessary to circumvent difficulties related to attaining the requisite retrace time because of the limited speed of modern opamps. This paper analyzes the design of opamp based horizontal sweep generators for three tube portable TV cameras. The three sweep channels consist essentially of a sawtooth generator driving one input of the opamp while the centering voltage source drives the other input; the opamp in turn drives a current amplifier. Analytical expressions are derived for the slew rate, V, the shift in the output voltage of the generator caused by temperature and timewise instability as well as the ratio of this shift to the peak-to-peak output voltage. The following opamps are recommended for such designs: K140UD1B (V = 10 volts/microsecond), K140UD10, K574UD1A and K544UD2B (all V = 50 volts/microsec). A schematic is given for a sweep generator using a K574UD1A with the following specifications: supply voltage ±15 volts, current consumption of 5.5 ma, voltage gain of 150 V/mV, zero bias voltage of 20 mV, a slew rate of 50 volts/microsec, an output voltage of 12 to 13 volts into a load of 10 Kohms with an input impedance of 10^{11} ohms. A separate +50 volt supply is included for the sole purpose of reducing the retrace time. The general design considerations for such applications of opamps are discussed and the specific operation of the design example is treated in some detail. Figures 4; references: 5 Russian, 1 Western in translation.
[248-8225]

UDC 621.383.8:[621.391.837:621.397.13

EVALUATING CHARACTERISTICS OF PHOTOELECTRIC TRANSDUCERS IN THE CASE OF SPATIAL DIGITIZATION OF VIDEO IMAGES

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 2, Feb 81 pp 32-35

SEMENOV, V. N. and EYSSENGARDT, G. A., Leningrad Electrical Engineering Institute imeni V. I. Ul'yanov (Lenin)

[Abstract] The photoelectric conversion of transmitted TV images usually involves spatial digitization: one-dimensional digitization transverse to the horizontal lines in the case of line by line or interlace scanning; or two-dimensional in the case of pulse readout in storage tubes, digital message coding or when using charge coupled devices. The measurement of the frequency response and resolution of photoelectric transducers based on test patterns containing alternating black and white lines becomes difficult because the modulation level of the signals depends on the position of the bands relative to the readout grid. Difficulties in colocating the grid with the strips are exacerbated by scanning nonlinearities and coordinate distortions as well as by factors related to the storage and interlacing in CCD's. This paper treats the application of the Moire fringe patterns resulting from one- and two-dimensional digitization of video images to the measurement of the characteristics of the photoelectric converters used (aperture-frequency response, contrast and video signal modulation level). The use of spurious patterns produced by photoelectric conversion with spatial digitization is analyzed in considerable detail, using pictures which show the primary and secondary Moire patterns produced from a circular striped test pattern with Fresnel bands for the following cases: 1) The pattern resulting from a zonal grating with a one-dimensional discrete structure; 2) Patterns from a zonal grating and a two-dimensional discrete structure with orthogonal and triangular readout grids; and 3) The images of a zonal grating transmitted by a three-phase CCD matrix with line by line scanning. It is shown that standard Fresnel zone test patterns can be used to ascertain the resolution of a photoelectric transducer with two-dimensional image digitization. The requisite modulation level for the center of the primary spurious pattern can be determined from the criteria given. Figures 5; references 15: 14 Russian, 1 Western in translation.
[248-8225]

UDC 621.394.74:621.397.13

MULTIPLEXING TELEVISION CHANNELS WITH TELEGRAPH COMMUNICATION

Moscow ELEKTROSVYAZ' in Russian [illegible] 5, May 81 (manuscript received 4 Jul 80) pp 17-19

ANTONISHIN, V. Z., BELYAYEV, A. F., GOLUBEVA, V. G., PISARCHUK, V. M., POPSHE, Yu. I. and SHIDENKO, S. K.

[Abstract] In 1975 a description was published of a unique, with respect to its simplicity, system of information service for owners of television sets at home,

in establishments or educational lecture halls. Thanks to this system called DATA-DOT^{tm} ("Servicing of data incoming to subscribers through a dot on the screen of a television set"), television sets, together with ordinary reception of TV programs, are used as terminals of a data distribution system. The overall DATA-DOT^{tv} system is described and problems of organization of a Soviet system similar to it are considered. It is concluded that the theoretical and experimental studies made of the problems of organization of phantom discrete channels with frequency-shift keying of 50 bit/sec in occupied TV channels by the method of forming "point-channels" on the raster showed that it is possible to realize also a system of television with a frequency change of the field of 50 Hz. With the merits of the system taken into account as well as the reality of obtaining economic and social effects, a similar system of circular data transmission can be used for the needs of the State Committee of the USSR for Television and Radio Broadcasting, the State Committee for Publishing Houses, Printing Plants and the Book Trade, TASS, NOVOSTI, the USSR Ministry of Communications and other departments. Figures 6; 5 Russian, 1 Western.
[313-6415]

UDC 621.397.13

CALCULATING TELEVISION RELAY STATION SERVICE AREA

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 2 Jul 80) pp 6-10

SHUR, A. A.

[Abstract] During exposure to interfering stations, the service area of low-power television relay stations is ordinarily calculated by the methods discussed in documents of the International Organization of Radio Broadcasting and Television (OIRT). In a number of instances this method can be simplified, if each interfering station is duplicated by an equivalent source of interference situated at the point of installation of the relay station. The following items are considered in the present paper: 1) The initial conditions of the calculation; 2) The principles of the proposed method of calculation; 3) Methods of calculating service zone recommended by OIRT; and 4) Comparison of calculation methods. It is concluded that the proposed method of calculation makes it possible with comparative simplicity to calculate the service area of television relay stations with a radius of 10-30 km. The method is particularly suitable for a smooth level location. Figures 6; tables 2; references 9: 4 by OIRT; 1 by MKKR; 2 Western (1 in translation).
[313-6415]

UDC 621.397.61:681.772.77:621.382

SOLID STATE TELEVISION CAMERAS WITH INTERNAL COLOR SEPARATION

Moscow TEKHNIKA KINO I TELEVIDENIYA in Russian No 2, Feb 81 pp 39-40

DENISENKO, V. V., KURBATOV, L.NN. and SHAKHIDZHANOV, S. S.

[Abstract] While color separation in existing color TV cameras is accomplished external to the light sensitive element, it is possible to achieve color separation in solid state semiconductor photodetectors by virtue of the dispersion of the light absorption coefficient directly in the semiconductor structure. In semiconductors with a composition which varies with respect to one coordinate, the different wavelengths are absorbed at differing depths when illuminated from a definite position. By spatially separating the light generated charge carriers, information can be derived from one signal detector concerning the various portions of the spectrum present. This paper analyzes a proposed buried channel CCD color TV camera. It is proposed that the specified spectral response of the CCD be achieved by varying the width of the forbidden band, which is governed by the material composition, as well as the position of the channel boundaries and through the use of the spectral function of a light transmitting filter inserted ahead of the CCD matrix. The conditions under which a spectral response close to that necessary for TV broadcasting can be obtained through internal color separation are specified. The width of the forbidden band in $Ga_{1-x}Al_xAs$ is plotted as a function of a physical distance coordinate showing the shape necessary in the color TV case. The transmittance spectrum of the proposed light filter is also shown and it is argued that the requisite structures can be fabricated with epitaxial techniques to produce such devices capable of internal color separation. The treatment is theoretical and no experimental data are indicated. Figures 3; references 13: 9 Russian; 4 Western.
[248-8225]

UDC 681.75+681.772.2

SMALL-SIZE PANCRATIC TELESCOPE WITH A CAMERA

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 (manuscript received 20 Dec 79) pp 21-23

GONCHARENKO, Ye. N. and OSIPOVA, L. P.

[Abstract] A 1975 report by Goncharenko and others presented a description of a small-sized telescope, which permits a pancratic shift of magnification from 4 to 20 times. Because of the large range of alteration of the magnification in combination with the small dimensions and mass, the telescope attracts the attention of tourists and amateurs of sporting spectacles and obtains a positive evaluation. Improvements have been made with the object of removing a number of structural shortcomings and an increase of the quality of representation. A new

modification of the telescope is described in the present paper, the special feature of which is the presence of a photochannel. The telescope with a camera makes it possible simultaneously to conduct observation and photography of objects. The photographic channel has a constant focal length of 167 mm. The "Smena-8M" camera is used. Detailed optical characteristics of the observation and photographic channels are presented. It is concluded that it is advisable to carry on improvement of the telescope in the direction of development of a new camera with decreased dimensions, the layout of which must be maximally adapted to a given device. Figures 3; references: 2 Russian.
[271-6415]

CERTAIN ASPECTS OF RADIOASTRONOMY, SATELLITES AND SPACE VEHICLES

UDC 523.2:523.164.8

REFRACTION EFFECTS IN THE VENUS ATMOSPHERE FROM BISTATIC RADAR DATA

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian No 4, Apr 81 (manuscript received 2 Apr 80, after completion 1 Sep 80) pp 401-407

PAVEL'YEV, A. G., KUCHERYAVENKOV, A. I. and MILEKHIN, O. Ye., Institute of Radio Engineering and Electronics, USSR Academy of Sciences

[Abstract] The paper discusses the methods and results of the first experimental measurements of the refraction of radio waves in the atmosphere of Venus. This measurement of refraction effects, conducted by the method of bistatic radar at $\lambda = 32$ cm using the "Venera-9" and "Venera-10" satellites gave results consistent with the results anticipated on the basis of the existing theory of propagation of radio waves in the dense atmosphere of Venus. The magnitude of the generalized coefficient of spherical divergence B^2 varies in the limits from 0.12 with $\Psi = 16°$ up to 0.01-0.02 with $\Psi = 9°$. Introduction of the concept of a generalized coefficient of spherical divergence is advisable in connection with the fact that just this coefficient is found from measurements of the dependence of the difference of the frequencies of the reflected and direct signals on the time. Knowledge of this coefficient makes it possible to exclude, during measurement of the coefficient of reflection from a planet, factors connected with the effect of the atmosphere, which simplifies finding the magnitude of the dielectric constant and the density of the ground of the planet. The results discussed in the paper confirm the validity of the proposed method of measuring the refractive parameters and indicate the effectiveness of the use of the method of bistatic radar for investigation of the atmosphere of Venus. Figures 4; references 10: 8 Russian, 2 Western.
[321-6415]

UDC 621.394.662.2

COMPARISON OF CLOCK-PULSE SYNCHRONIZATION DEVICES

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 16 Apr 80)
pp 42-46

POVALYAYEVA, I. V.

[Abstract] Interference immune reception of discrete frequency-modulation signals requires clock-pulse synchronization. Here the synchronization error at the output of three different devices used for clock-pulse extraction and shaping in ultrahigh-frequency channels (satellite communication) is evaluated on a comparative basis. The same method of calculating the rms error is used for 1) The basic device consisting of a differentiating circuit followed by a square-law rectifier, then a filter tuned to the clock-pulse frequency, and a pulse shaper at the output; 2) A modification of this basic device which includes a stage of two adders and two delay lines between the rectifier and the filter; and 3) A modification of the basic device where the differentiating circuit and the rectifier are replaced with a delay line and a multiplier of the time delay by half the duration of an elementary message. The calculations involve determining the ratio of signal amplitude to rms interference at the filter output. The results indicate that steady-state fluctuations of clock pulses are widest at the output of the basic device, less than half as wide and very different at the outputs of the other two devices. The interference immunity of the basic device can be improved by increasing the signal-to-interference ratio at the input. The reference voltage and the synchronization signal are formed sequentially in the first two devices and in parallel in the third device, the latter being therefore recommended for use under more severe time constraints. Figures 4; references: 8 Russian.
[316-2415]

COMMUNICATIONS, COMMUNICATION EQUIPMENT, RECEIVERS AND TRANSMITTERS, NETWORKS, RADIO PHYSICS, DATA TRANSMISSION AND PROCESSING, INFORMATION THEORY

UDC 537.533.3

SPATIAL INFORMATION CARRYING CAPACITY OF OPTICAL ISOPLANAR CHANNEL FOR INFORMATION TRANSMISSION

Leningrad IZVESTIYA VYSSHIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No 5, May 81 (manuscript received 20 May 80) pp 88-92

KALINCHUK, V. I.

[Abstract] The paper is concerned with the development of methods for evaluating the spatial information carrying capacity of an optical channel for information transmission and an investigation of information transfer through an optical isoplanar [flat] channel. The quantum-statistical and wave properties of optical radiation as a carrier of information are taken into account. The paper was recommended by the Department (Kafedra) of Optical Electronic Devices, Leningrad Institute of Precision Mechanics and Optics. References 6: 5 Russian, 1 Western in translation.
[314-6415]

UDC 537.876.23:551.510.52

EFFECT OF REFRACTIVE INDEX FLUCTUATION ON WEAKENING OF A FIELD IN A TROPOSPHERIC WAVEGUIDE

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian No 4, Apr 81 (manuscript received 25 Feb 80) pp 408-414

FREYLIKHER, V. D. and FUKS, I. M., Institute of Radiophysics and Electronics, USSR Academy of Sciences

[Abstract] A tropospheric waveguide formed by inversion of the refractive index is an open system. In the case of propagation of a signal in such a waveguide, part of the energy is "lighted up" in the upper layer of the atmosphere. The attenuation caused by this has been calculated for a normal dependence of the dielectric constant on the height. In a real waveguide the presence of a different kind of random factors leads to fluctuations of the parameters of a waveguide

(forms of a surface, refractive index, etc.), scattering of which causes an additional weakening of the signal. The decrement of decay of the coherent part of a field of the nth mode is presented. In order to calculate the field strength in an irregular waveguide it is necessary to solve the equation of the radiation transfer, which takes into account both the regular attenuation and the exchange of energy between modes caused by scattering at inhomogeneities. In case a tropospheric waveguide is multimode the problem is substantially simplified. In fact, although the tropospheric waveguide is multimode, weak attenuation has only a few of the first modes, which are propagated at small angles to the surface. Their number is determined by the height of the inversion point and by the gradient of the refractive index. In a real troposphere these magnitudes as a rule are such that for ultrashort radio waves, only the first mode is captured by a near-surface waveguide. The remaining modes are intensely lighted up from the waveguide, by virtue of which their energy quickly decreases with distance and at fairly large distance practically does not contribute to the intensity of the signal within the waveguide. This indicates that the energy passing during scattering from the first mode into the rest withdraws from the waveguide, and in contrast to a closed system, it is possible to neglect scattering from the modes with a number $m > 1$. Because of this the transfer equation is simplified, and can be obtained for the intensity of the first mode. The object of the present paper is to calculate the attenuation caused by scattering by fluctuations of the refractive index of air in a near-surface tropospheric waveguide when the coupling coefficient ω_{1m} has a specified form. The authors thank I. Ye. Ostrovskiy and I. V. Kukushkin for helpful discussions. Figures 1; references: 10 Russian. [321-6415]

UDC 551.510.535

VARIATION OF LOWER IONOSPHERE PARAMETERS UNDER THE EFFECT OF POWERFUL RADIO-FREQUENCY RADIATION

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian No 4, Apr 81 (manuscript received 13 May 80) pp 415-419

ITKINA, M. A. and KROTOVA, Z. N., Scientific-Research Radiophysics Institute

[Abstract] A theoretical problem concerning heating of the lower ionosphere by powerful radio-frequency radiation consists in a simultaneous investigation of the equations of an electromagnetic field, the electron temperature and the ionization balance equation. The authors conducted such an investigation by means of a numerical solution of a self-consistent system of these three equations on a BESM-6 computer with the following assumptions: 1) A nonlinear wave equation for a field is solved in an approximation of geometrical optics; 2) The equation of the electron temperature is solved with neglect of the time changes of temperature ($dT/dt = 0$); and 3) In the ionization balance equation, the mechanism of ionization and the recombinations essential in very strong fields $E \geqslant E_p$ are not taken into account. With a powerful transmitter operating at present at Gor'kiy, the maximum variation by day of the differential absorption

of the test wave took place in the region of height of 75-85 km. The normal component of the test wave is absorbed to a lesser degree than the nonnormal. Experimental results obtained at Boulder (USA) are qualitatively explained. Figures 4; references 10: 6 Russian, 4 Western (one in translation).
[321-6415]

UDC 621.315.2:62-758.37

EVALUATING ELECTROMAGNETIC SHIELD EFFICIENCY

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 (manuscript received 29 Nov 80)
pp 86-89

BALOVLENKOV, Ye. V. and BONDAR', V. M.

[Abstract] Much work of Soviet and foreign specialists is devoted to problems of shielding, theoretical investigations of continuous shields, and problems of the choice of the design of cable shields. Consequently, a comparative analysis of the results of this work, as well as a comparison with experimental data is of interest. Specifically, consideration is given in the present paper to such items as the manner in which the efficiency of shielding is determined; determination of the shielding properties of coaxial and other nonsymmetrically loaded shielded cables; theoretical investigations of cylindrical homogeneous shields; and precise solution of problems of shielding of cylindrical tubes in an inhomogeneous magnetic field. The names of many individuals concerned with shielding problems are cited in the text. Figures 1; references 8: 6 Russian, 2 Western.
[325-6415]

UDC 621.315.2:535.8

STATE OF THE ART IN OPTICAL-CABLE COMMUNICATION SYSTEMS TECHNOLOGY

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 16 Jun 80)
pp 23-27

KSENOFONTOV, S. N., FEDOROV, B. P. and FOMICHEV, B. N.

[Abstract] On the basis of foreign published sources, a survey is made of the state of the art in optical-cable communication systems technology in Western countries and Japan. The equipment consists essentially of optical fibers assembled into cables, optical connectors, light sources and photoreceivers. Preference is given to wideband single-mode or multimode optical fibers with a smooth profile of the refractive index (gradiental fibers) featuring low losses and dispersion. Optical cables are being developed and built along three different concepts: classical stranding around a center core (Germany), stranding in helical slots around a core (France), and tape winding (Bell Labs./USA). Connectors come in many split and permanent varieties, the former provided with

miniature V-grooves and the latter produced by welding. As light sources are now used light-emitting diodes and Ga Al As lasers, while GaInAsP/InP devices are being developed. As photoreceivers are now used ARD (Si or Ge) and PIN (Si or GaAs) detectors, while a PIN/PET combination as well as InGaAs, InGaAsP and AlGaAsSb devices are being developed. The development of optical communication systems, beginning in the nineteen fifties and projected into the nineteen nineties, is conceived as a sequence of four generations with successively improved components and better performance characteristics for a broader scope of applications. Figures 8; references: 12 (Western "Telekom-79" exhibition).
[316-2415]

UDC 621.315.2:535.317

CROSSTALK BETWEEN OPTICAL FIBERS DURING PAUCIMODAL TRANSMISSION

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 15 Jul 80)
pp 20-22

GRODNEV, G. I.

[Abstract] Crosstalk between optical fibers is considered in the case of a cable line transmitting a single mode or a few modes only. The analysis is based on the solution to the Maxwell field equations for an electric wave (longitudinal component of the electric field intensity and tangential component of the magnetic field intensity) and for a magnetic wave (longitudinal component of the magnetic field intensity and tangential component of the electric field intensity) in the various zones of the fiber cross section, taking into account both reflection by and transmission through the fiber shell according to the laws of geometrical optics. The results indicate that the crosstalk immunity in the case of wavelengths comparable with the fiber diameter improves with increasing thickness of the shell and with increasing dielectric permittivity of the shell material, a shell also being more effective at higher frequencies. It is recommended that optical fibers be made of longitudinally and transversely homogeneous materials, be protectively coated with absorbing materials, and be spaced apart as far as possible. References: 6 Russian.
[316-2415]

UDC 621.315.23

TRANSMISSION PARAMETERS OF GROUND WIRE OF SINGLE-WIRE UNDERGROUND LINES IN TWO-LAYER GROUND

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 (manuscript received 10 Dec 79) pp 48-51

BONDARENKO, O. V. and KALYUZHNYY, V. Ye.

[Abstract] The paper determines the total longitudinal resistance of the ground wire of an infinitely long single-wire underground line, with the effect of the parameters of the geoelectric structure of two-layer ground taken into consideration. Calculations are presented for the resistance and inductance of the ground wire for two types of two-layer ground. The solution of this problem is also suitable for a multi-layer structure of the earth, which it is possible to reduce to two-layers. It is concluded that nonuniformity in the earth's structure considerably affects the vector-potential of an infinitely long underground line, and consequently also the transmission parameters of the ground wire. For two-layer ground, these parameters depend on the radius of the underground line, the thickness of the upper layer and the wave number of both layers. Determination of the parameters of the ground wire with the nonuniformity of the earth taken into account makes it possible more precisely to calculate the degree of the effect of exterior electromagnetic fields on communication networks and to create a more economical and effective means of protection. Figures 1; references 6: 5 Russian, 1 Western.
[308-6415]

UDC 621.315.311.4

THREE-PHASE INSULATED CABLE LINE WITH ASYMMETRICAL ARRANGEMENT OF PHASE

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 2, Feb 81 (manuscript received 4 Jun 80) pp 14-19

BOBIKOV, V. Ye., KORNEYEV, V. I., KOCHETYGOV, V. I. and TRIPOTEN', I. G., engineers

[Abstract] An asymmetrical system of arrangement of the conductors in a 3-phase gas-filled cable line (GCL) is proposed. The principal construction of a GCL based on a 1979 Soviet invention is shown, in which the current-carrying conductors are arranged asymmetrically with respect to the longitudinal axis of the cable. Abandonment of the traditional symmetrical arrangement of the current-carrying conductors raised the problem of an optimum cross section of the GCL, i.e., to find the relations among the dimensions of the cross section in which the stress level on the conductors would be minimal. This problem is solved analytically and experimentally. The experimental and theoretical values are in

good agreement. The paper was submitted by the Scientific-Technical Council, All-Union Electrical Engineering Institute imeni V. I. Lenin. Figures 4; references 7: 6 Russian, 1 Western.
[269-6415]

UDC 621.315.578.37

REQUIREMENTS ON COEFFICIENT OF PROTECTIVE ACTION FOR METAL SHEATHING OF COAXIAL CABLE WITH EFFECT OF HIGH-VOLTAGE LINE

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 (manuscript received 12 Jul 79) pp 45-47

POPOV, S. A.

[Abstract] The paper determines the requirements on the coefficient of protective action (CPA) of the metal sheathing of main line coaxial cables with the effect on them of high-level induced longitudinal electromotive forces up to 2000 V/km of industry frequency. It is concluded that the requirements obtained on the CPA of the metal sheathing of communication cables, intended for laying in districts contiguous with high-voltage lines, make it possible to select with more soundness the screens of main line coaxial cables. Figures 3; tables 4; references: 5 Russian.
[308-6415]

UDC 621.317.799.088

AUTOMATIC SYSTEM FOR MEASURING MICROWAVE RADIO NETWORK CHARACTERISTICS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 5, May 81 pp 56-57

GONIKMAN, A. B., GORLOV, N. I., DUBKOV, N. F., KRSHEMINSKAYA, Ye. V. and PURTOV, A. V.

[Abstract] Systems have gained ground at present for measurement of the scattering parameters of microwave radio networks with transfer of measuring information from the time area to frequency by an algorithm of a discrete Fourier transform. Their merit is the rapid and satisfactory precision of measurements over a wide range of frequencies. The authors consider a measuring system with a stroboscopic conversion for measuring the parameters of radio networks in the time area and the instability is evaluated of time scanning and the signal-to-noise ratio which gives the major contribution to the error of measurements. A block diagram of the measuring system is explained. Series microcircuits 2PD522 and K155 are used in the digital-analog converter of the system. Figures 1; references: 1 Western.
[309-6415]

UDC 621.371.24

STATISTICAL CHARACTERISTICS OF RAPID PHASE FLUCTUATIONS OF CENTIMETER WAVES BEYOND THE HORIZON

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 (manuscript received 28 Jul 79)
pp 31-34

RYBAKOV, B. S.

[Abstract] Calculations are made on a computer of the root-mean-square value and the time interval correlation of the phase fluctuations of a signal, by the use of known amplitude measurements for a 10-cm wave which were performed in June-September of 1964 and 1965 paths near the ground, and within the limits of a Gaussian model of the field. For convenience of comparison, the same contacts were used as in a 1972 paper coauthored by Rybakov. The overall number of contact entries with a duration of 1-3 min used in the present work exceeded 1,000. The principal formulas and graphs used in the recalculation are presented, as well as data concerning variations of these characteristics as a function of the time of day and the length of the path. Figures 6; tables 1; references: 6 Russian.
[308-6415]

UDC 621.371.24

CONSTRUCTING COMPUTING SYSTEMS IN COMMUNICATION SECTOR

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 (manuscript received 11 Apr 79)
pp 35-40

YEVREINOV, E. V., YEFIMOV, I. Ye. and MAMIZELEV, I. A.

[Abstract] An intensive introduction is taking place at present of the means of computing techniques into electrical communication systems. The problem has arisen of investigating the principles of construction of computing means on the basis of a model of a collective of computers, which makes it possible to create reliable, inexpensive and flexible computing systems. A union of them with the means of communication is a technical basis of a unified integrated digital system for interchange, storage and processing of information. A detailed study is made of the following items: 1) Model of a collective of computers; 2) Technical realization of a model of a collective of computers; 3) Example of use of a model of a collective of computers in devices for control of switching points; and 4) Prospective use of computing means on the basis of a collective of computers. The authors conclude that use in communication techniques of computing means which employ a model on one computer, constructed on the principle of successive fulfillment of operations, a fixed logical structure and constructional nonuniformity does not assure the volume of computations necessary for a sector. The model of a collective of computers utilizing the principles of parallelism of fulfillment of operations, changeability of logical structure and constructive uniformity,

which is proposed for use in the computing means of communication techniques is without the shortcomings mentioned. The examples presented show the outlook and the simplicity of technical realization of the model in the highest volume communication devices, particularly in switching points for various purposes. Figures 4; references: 11 Russian.
[308-6415]

UDC 621.371.25

RADIO WAVE REFRACTION BY ARTIFICIAL DISTURBANCES OF THE IONOSPHERE: A NUMERICAL EXPERIMENT

Gor'kiy IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOFIZIKA in Russian No 4, Apr 81 (manuscript received 4 Apr 80) pp 420-424

IVANOV, V. B. and SVISTUNOV, K. V., Irkutsk State University

[Abstract] Disturbances of the ionosphere in the case of the powerful effect of the radio-frequency radiation of a surface transmitter have an extremely diverse nature and appear in particular in a general redistribution of the plasma density in the irradiated area. The possible effect is shown of artificial nonuniformities in the propagation of decimeter radio waves and some numerical evaluations of such an effect are presented. The authors investigate the propagation of waves with the use of an especially developed model of an artificial disturbance described in a 1979 work, of which Ivanov was one of the coauthors. The model is an algorithm of a numerical solution of a system of equations which describe the condition of the ionosphere with a supplementary source of heating of the plasma. Real characteristics of the upper atmosphere and ionizing radiation are arranged in the model and all the significant mechanisms for forming the ionosphere are taken into consideration. The investigations conducted show that the additional refraction at the artificial nonuniformity of the ionosphere can substantially effect the propagation of radio waves and lead to fairly diverse effects, which can be used for solution of practical problems of radio communication. Figures 5; references: 9 Russian.
[321-6415]

UDC 621.372:621.391.82

DEPTH OF NOISE SUPPRESSION IN THE HETERODYNE OF MILLIMETER WAVE RECEIVER WITH THE AID OF ZEHNDER-MACH INTERFEROMETER

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 2 Jan 80) pp 658-660

GORONINA, K. A., KUKIN, L. M. and LUBYAKO, L. V.

[Abstract] The Zehnder-Mach interferometer is used as an element of the high-frequency channel of receivers for the shortwave part of the millimeter waveband. It achieves an effective rejection of heterodyne noise. In this connection a fuller quantitative analysis of the interference suppression of noise is of interest. Published works give only a qualitative explanation of the noise rejection; the depth of noise suppression has not been measured. The present short communication is concerned with the depth of noise suppression, obtained experimentally and theoretically. A table gives the values of the coefficient of suppression k, obtained as the result of measurements and by calculations. The large size of the coefficients of suppression indicates the usefulness of the interference method of noise suppression. The agreement observed of the experimental and calculated results demonstrates the possibility of realization of an interferometer with characteristics close to ideal. Figures 1; tables 1; references: 5 Russian.
[324-6415]

UDC 621.372.852.1

ELECTRICAL CHARACTERISTICS OF CORRUGATED COAXIAL CABLES

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 26 Sep 79)
pp 33-36

VOL'MAN, V. I., DOREZYUK, N. I. and PAMPU, Yu. A.

[Abstract] The results are presented of a rigorous electrodynamical analysis of corrugated coaxial cables (CCC) based on an integral representation of Veku and the Floquet theorem developed in 1975 and 1978 papers of which Vol'man is the principal author. Because corrugation of a cable is done in order to give it flexibility and to improve its mechanical characteristics, the profile must be made smooth, without breaks or curves. The electrical characteristics of CCC are considered, the profile of the external conductor of which is a limited smooth curve. Principal attention is given to such important characteristics as phase velocity, wave impedance and attenuation. It is concluded that a rigorous electrodynamical analysis makes it possible correctly to take into account the effect of the form and amplitude of the corrugation on the electrical characteristics of the CCC. With the use of the results presented it is possible to develop a flexible CCC, which has stable electrical characteristics and a wide frequency band. Figures 7; references 6: 5 Russian, 1 Western.
[313-6415]

UDC 621.376.56

LINEAR RATE OF IKM-15 DIGITAL TRANSMISSION SYSTEM

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 (manuscript received 12 Sep 80) pp 6-13

ABRAMOV, G. A., PTICHNIKOV, M. M., SAVCHENKOV, Yu. P. and TREMBITSKAYA, Z. Ya.

[Abstract] The paper presents the principal characteristics of the IKM-15 digital transmission system which is intended for use on rural telephone networks and which assures transmission of a digital signal to a distance not exceeding 50 km. The linear route of the IKM-15 is constructed in accordance with a single-cable single-band circuit based on various types of single-quadded cables. A two-level linear signal is relayed via the cable, the pulse duration of which is equal to the clock interval, The rate of data transmission via the line route is 1024 kBit/sec. The algorithm of forming the linear signal provides for a change of its level at the moment of the appearance of unity in the transmitted binary signal. Zero of the original binary signal does not produce a change of the level of the linear signal. The following aspects of the system are discussed: 1) Intermediate station for regeneration of the linear signal relayed by the cable; 2) Linear regeneration amplifier; 3) Construction of intermediate station and linear regeneration amplifier; and 4) ULR-15 linear regeneration amplifier. The parameters of the ULR-15 presented correspond to the established norms. However, there is a real possibility of a further perfection of the ULR-15 and an improvement of its qualitative indices. The circuit is shown of the terminal unit of a linear route. Figures 10; references: 2 Russian.
[308-6415]

UDC 621.384.326.22

EFFECT OF INTERSYMBOL DISTORTIONS ON INFORMATION TRANSMISSION OVER OPTICAL CABLE LINES

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 31 Jan 79) pp 17-19

GAVLIN, M. E. and YEMIN, V. I.

[Abstract] Data transmission over optical cable lines by a binary pulse signal is considered, a photodetector converting the luminous flux to an electric signal at the output. This signal can be regarded as the sum of independent photon current pulses with a Poisson distribution, their number being proportional to the intensity of the input quantity. The output process function is then calculated, taking into account the dispersive properties of an optical cable, by subdividing the readout time into subintervals and letting the length of the latter approach zero. The expression for the probability of reception error derived on this basis indicates the effect of intersymbol distortions and how this effect increases with increasing value of the product of readout time by

square root of the attenuation coefficient. For a better noise immunity of reception, accordingly, either the power of the input signal must be increased or the transmission speed must be decreased. Figures 1; references 5: 4 Russian, 1 Western (in translation).
[316-2415]

UDC 621.391

RAPID CALCULATION OF AMBIGUITY FUNCTION OF FREQUENCY-SHIFT KEYING SIGNALS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 7 Dec 79) pp 101-103

GONTARENKO, V. P.

[Abstract] In the case of use of iterated locally-optimum methods of optimizing the ambiguity functions of frequency-shift keying signals, the development of "rapid" methods of calculating the specific function of the optimizing problem has an important value. The present paper considers one of such methods in connection with the problem of frequency-shift keying signals, optimizing the ambiguity with respect to the minimax criterion with use of the method of coordinate descent. References: 2 Russian.
[268-6415]

UDC 621.391.1.037.37

DETECTING FAULTS IN QUASI-TERNARY SIGNALS

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 20 Aug 79) pp 30-34

PTICHNIKOV, M. M. and FADEYEV, A. N.

[Abstract] Long digital signal transmission channels require inspection in order to detect and clear faults in those signals which will cause the error factor to exceed its normal mean value. Here the transmission of signals by quasi-ternary codes (HDBn, BnSZ, PRKK) is considered and devices for detecting faults in their transmission are described. The detector of long pauses between individual messages, because of the many zeroes between them where the code provides only a few, consists of a pulse polarity discriminator, a NOR gate, a sawtooth voltage generator, a threshold device, another OR gate, a pulse duration discriminator, a monostable multivibrator, and an output amplifier. This detector is not suitable for linear codes with alternation of polarities by inversion of unities. Long series of zeroes are normally permissible in such codes and only faulty alternation of polarities, failures to invert, must be detected. The device for this purpose consists of a pulse polarity discriminator, two pulse shapers, two

triggers, five 2NAND gates and one OR gate. For linear codes with multilevel alternation of polarities by inversion this detector must be modified, by replacement of the first 2NAND gate with an AND gate and addition of triggers and 2NAND gates, to detect whether the algebraic sum of unities is exceeded where two or more consecutive unities of the same polarity are normally permissible. These devices have been successfully tested in a pilot line of digital signal transmission at the rate of 8448 kbits/s. Figures 6; references 5: 4 Russian, 1 Western.
[316-2415]

UDC 621.391.2:551.510.535.510.53

ERRORS OF MULTIDIMENSIONAL IDENTIFICATION OF IONOSPHERE PARAMETERS IN THE METHOD OF NONCOHERENT SCATTERING

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 28 May 79) pp 552-559

PRESNYAKOV, I. N.

[Abstract] The precision of determination of ionosphere parameters is investigated by the method of noncoherent scattering of radio waves with the use as sounding signals of monochromatic oscillations or a succession of individual pulses without intrapulse modulation. The investigation is conducted by the method of statistical simulation of procedures for processing signals which makes it possible to study the effect of a large number of factors in the precision of measurements. An investigation algorithm is worked out. Certain data are presented from calculations made on a computer by the proposed algorithm of the relative root-mean-square magnitude of random errors of measurement of two ionosphere parameters, $P_1 = \beta$ and $P_2 = \Delta\Omega$, where $\beta = T_e/T_i$; T_e, T_i are respectively the kinetic temperatures of electrons and ions; $\Delta\Omega$ is the function T_i. A simplified model $W(\omega)$, which is also used, can approximate the spectrum of a signal scattered by ionospheric plasma in a region with an approximate height of 200 to 500-600 km. In this region it is possible approximately to assume that the ionospheric plasma--two component--consists of electrons and ions of oxygen O^+ with a single positive charge, no magnetic field, and collisions between electrons and ions are absent. Figures 3; references 8: 1 Russian, 7 Western (two in translation).
[324-6415]

UDC 621.391.8

AUTOMATIC DEVICE WITH CONTINUOUS SET OF CONDITIONS FOR DETECTION OF WEAK FLUCTUATING SIGNALS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 11 Nov 79) pp 84-85

DOLININ, N. A.

[Abstract] This brief work is closely connected with a 1979 paper of which Dolinin was the principal author (N. A. Dolinin and A. F. Terpugov, Probability of Errors During Truncated Successive Analysis in the Case of Similar Hypotheses, IZVESTIYA AKADEMII NAUK SSSR: TEKHNICHESKAYA KIBERNETIKA, 1979, No 1, p 145). Conditions are mathematically defined, which in practice involve significant cases: long-range detection by radars (detection of weak signals) and detection of coherent connected signals. Parameters which characterize the effectiveness and quality of operation of an automatic device (not described) are derived. These are: 1) An expression (α) is derived for the probability of false alarm, and 2) An expression (β) for the probability of admission of the target and the average time of detection. The effectiveness and quality of operation of an automatic device is evaluated. References: 3 Russian.
[268-6415]

UDC 621.391.23:621.376.56

INTERPOLATIONAL METHOD OF SHAPING NARROW-BAND SIGNALS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 9 Dec 79, after revision 30 Jun 80) pp 105-106

BORZYKH, V. Ye.

[Abstract] A method is known for transmission of symbols by signals of the form

$$Y_j = X_j\ [\sin \omega_0(t-jT)]/[\omega_0(t-jT)].$$

The spectrum of these signals does not contain a frequency above the limit $\omega_0 = \pi/T$, where T is the repetition interval of the symbols X_j. The present brief communication considers the problem of synthesis an interpolator and an analysis of its characteristics, which as the order of the interpolational polynomial N increases, makes it possible to shape signals approaching the narrow-band signals represented above. In the case of realization of a shaper of narrow-band signals, it should be borne in mind that the ranges of change of the signals of various elements of a circuit are not identical. Consequently for elimination of the possibility of the appearance of overload with respect to the signal of the circuit elements caused by the effect of buildup, it is necessary to select an amplitude of the input signal of the shaper $(1/2)2^N$ times

smaller than the permissible range of the change of the output signal of the memory element. Figures 3; references: 1 Russian.
[268-6415]

UDC 621.391.26

STATISTICAL EVALUATION OF SIGNAL DETECTION CHARACTERISTICS IN PULSE LOCATION SYSTEMS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 18 Oct 78) pp 640-643

SHEMSHEDINOV, R. B. and DUNAYEV, A. S.

[Abstract] An account is given of a statistical method developed by the authors for evaluation of the characteristics of the detection of pulse signals, allowing for the destabilizing factors of interior and exterior origin with the presence of normal noise. A concrete example of the calculation of threshold ratios is presented. The results obtained in this brief communication can be used during planning of pulse location systems as part of a rational choice of threshold ratios, allowing for the destabilization factors of an additive and multiplicative nature. Figures 2; references: 16 Russian.
[324-6415]

UDC 621.391.26

DETECTING AND ANALYZING PSEUDORANDOM PHASE SHIFT KEYING SIGNALS WITH A PRIORI UNCERTAINTY

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 12 Dec 79, after revision 28 Apr 80) pp 56-62

VARAKIN, L. Ye. and VLASOV, A. V.

[Abstract] A method is considered for detection of pseudorandom phase shift keying signals which makes it possible to distinguish a random sequence and a M-sequence and to determine the degree of the primitive polynomial n of a M-sequence. An analysis is made of the block structure of the signals investigated with the sequence of null symbols called the zero block and the sequence of unit symbols, the unit block. The problem is solved under conditions of a priori uncertainty, both with respect to the signal parameters and with respect to the fact itself of the presence of a signal in an accepted realization. An analogous detector can also be constructed on the basis of an analysis of the distribution of single blocks in the sequence used. A union of the two methods indicated makes it possible to improve the statistical characteristics of the detector. The detection algorithm gives a simple method of detection and analysis of

pseudorandom signals on the basis of an analysis of their block structure. Figures 3; references 7: 6 Russian, 1 Western in translation.
[268-6415]

UDC 621.391.63

PHASE STATISTICAL CHARACTERISTICS OF OPTICAL SIGNAL POWER FLUCTUATIONS IN ATMOSPHERIC COMMUNICATION CHANNEL

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 (manuscript received 29 Apr 80) pp 66-68

PEREDNYA, A. V. and POLISHCHUK, Yu. M.

[Abstract] Absence of data concerning the statistical characteristics of the phase difference of optical signal in a regime of "power fluctuations" gives rise to considerable difficulties for engineers developing phase information systems because fluctuations of the signals in an atmospheric channel produce a physical limit for improvement of the quality indices of such systems. In a 1969 work from the literature the statistical characteristics of the phase difference of two Gaussian signals are investigated with the assumption that their phases have a uniform distribution and an amplitude of distribution according to the Rayleigh law. Experimental and theoretical investigations of the characteristics of random optical signals in the atmosphere, conducted in 1975 and 1976 by Polishchuk, showed that their phase under conditions of power fluctuations are nonuniformly distributed. In the present paper the effect is analyzed of the nonuniformity of the phase difference of fluctuation by the components of a signal on the statistical characteristic of the phase difference of signals in two-channel systems. The average and mean square values for the phase difference are calculated on the M-222 computer with arbitrary magnitudes of the phase difference of the regular components of signals and the degree of nonuniformity of the phase distribution. Figures 2; references: 4 Russian.
[325-6415]

UDC 621.391.81:550.388.81

TIME LAG BETWEEN SIGNALS OF INDIVIDUAL BEAMS ON SHORT-WAVE RADIO COMMUNICATION PATHS

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 (manuscript received 2 Apr 80) pp 26-30

KHMEL'NITSKIY, Ye. A.

[Abstract] The paper considers possible time lags between the signals of individual beams which it is necessary for engineers to know when developing

short-wave radio communication paths. No data are given in the literature concerning time lag intervals for concrete paths and their changes in time. The magnitude of the time lag between beams depends on the position of a region of the ionosphere F. Possible changes of the parameters which characterize the position of this ionospheric region are studied. The following items are examined: 1) Actual and effective heights; 2) Variation of geometrical parameters; 3) Fluctuation of ionospheric parameters and time lags; and 4) Models of propagation of radio waves and magnitude of time lags. The procedure for calculating time lags is explained. The author draws the following conclusions: 1) It is necessary to conduct calculations of possible magnitudes of time lags between signals of individual beams with the real path of the propagation of radio waves taken into account. 2) Large magnitudes of the time lag are mostly connected with beams reflected from region F of the ionosphere (model of form IV). The average magnitude of the time lag substantially depends on the extent of the path and for a path with an extent of 1000-5000 km lies in the interval 0.5-3.5 microsecond. The minimum magnitudes of the time lag are characteristics for a path with an extent of approximately 3000 km. 3) In the years of a maximum of solar activity an increase takes place in the time lag (relative to the years of minimum solar activity) of almost two times. 4) The interval of change of the time lag at a specified path because of various parameters of the ionosphere during transition from one day to another is rather wide. At a middle-latitude path with an extent of 1500 km this interval for winter months amounts to 1-3 microsecond. 5) In order to determine the frequency of appearance of one or another magnitude of the time lag, it is necessary to make a calculation of the probability of existence of models of the propagation of radio waves of forms IV and V and subsequently to determine the magnitude of the time lag in a given model. Figures 7; tables 1; references: 7 Russian.
[308-6415]

UDC 621.391.172

NOISE IMMUNITY OF FREQUENCY AND RELATIVE PHASE-SHIFT KEYING UNDER CONDITIONS OF LIMITED BANDWIDTH AND WITH PEAK SIGNAL POWER

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 13 Aug 79, after revision 27 Jun 80) pp 68-74

MAKAROV, S. B., ULANOV, A. M. and TSIKIN, I. A.

[Abstract] The authors consider the effect of limiting the amplitude of radiated signals under conditions of intersymbol interference on the noise immunity of noncoherent reception, with the use of frequency and relative phase-shift keying, taking into account the permissible level of radiation outside the band. It is shown that under conditions of frequency-limited channels during operation of a radio transmitter in a regime of limited signal amplitude and with a specified radiation level outside the band, the energy gain with a noncoherent processing method at 3 dB (which assures signals with relative phase-shift keying unlimited with respect to spectrum), in comparison with signals with frequency phase-shift

keying for the conditions of reception, is on the order of 1 dB lower in magnitude in probability ranges of erroneous reception of 10^{-3} to 10^{-5} and the level of radiation outside the band of -40 to 60 dB. In order to increase the efficiency of use of relative phase-shift keying of signals in frequency-limited communication channels it is advisable to use special methods of shaping signals with the object of improvement of their spectral and correlation characteristics. Figures 4; references: 6 Russian.
[268-6415]

UDC 621.391:510.53

ASYMPTOTIC EFFICIENCY OF ADAPTIVE ITERATIVE ALGORITHMS FOR SIGNAL-TO-NOISE OPTIMIZATION UNDER NONSTATIONARY CONDITIONS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 29 Mar 78, after revision 11 Jan 80) pp 532-542

ABRAMOVICH, Yu. I.

[Abstract] The paper analyzes the asymptotic efficiency of stochastic iterative algorithms intended for optimization of the vector of a filter with respect to the criterion of the maximum signal-to-noise ratio with an a priori unknown correlation matrix. In the investigations conducted during study of the effect of drift of the adjustment parameters, a model is taken which assumes a uniform rate of transfer of the adjustment parameters of the valid signal at an interval of adaptation. The cases of drift of the adjustment parameters and the noise parameters (analysis of normal components of error matrix; analysis of fluctuating components of error matrix) are considered. It is concluded that the investigations conducted showed that the drift of the adjustment parameters of a signal, in the same way as the drift of the noise parameters imposes equal and compromise requirements on the choice of the amplification factor, on the basis of the condition of minimization of the noise power at the output of the filter being optimized. Tn the process it is shown that poor condition of the correlative matrix of the noise for typical situations leads to a pronounced difference of the effect of drift on the drift of the vector being optimized and the signal-to-noise ratio realized. It is based on the principle that in this case the high efficiency of suppression of the noise can take place with such a rate of drift when other properties of a present optimum solution (high directive gain, low level of the side lobes of a diagram, etc.) will not be conserved. During this, in the same way as in the stationary case, the rate of convergence to a solution which has a fixed (small) norm, the matrices of the second moments of mismatch between the optimum vector and the vector being optimized, is asymptotic the same for all stochastic iterative algorithms. However, in nonstationary situations the indicated equivalency does not imply equivalency of the stochastic algorithms with respect to optimization of the signal-to-noise ratio. References 10: 6 Russian, 4 Western (two in translation).
[324-6415]

UDC 621.391:519.217

OPTIMUM ESTIMATE OF THE PHASE OF A SIGNAL WITH SPACED RECEPTION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 28 Jan 80) pp 588-591

SHMELEV, A. B.

[Abstract] The author considers a nonlinear estimate of the phase-time fluctuations of the phase of a valid signal with the presence of two receiving points separated in space and with a background of white Gaussian noise. If the phases of the signals at the reception points are mutually correlated, then two-channel reception as compared with one-channel makes it possible to reduce the filtration error of the phase, which leads to an increase of the quality of reception. The apparatus of the theory of conditional Markov processes is used for solution of the problem. A nonlinear algorithm of filtration which is described by equations which are derived in the paper can be simulated with the aid of two interrelated loops of automatic phase control, one at each receiving point. The amplification factor and the coupling coefficient of these loops depend on the present values of the accumulants K_{ij} and change with them, which indicates the nonstationariness of the filtration regime. It is shown that in the process of filtration a decorrelation takes place of the fluctuations between the receiving points because of separation of the average a posterior values. Figures 1; references: 3 Russian.
[324-6415]

UDC 621.391:778.38

POSSIBILITY OF USING THE HOLOGRAPHIC METHOD FOR PROCESSING WIDE-BAND SIGNALS AT INCREASED FREQUENCY

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 7 Jun 78, after revision 28 Apr 80) pp 638-639

MANSUROV, A. N., MASLENNIKOV, N. M., NIKOLAYEV, V. N. and ETKIN, V. S.

[Abstract] It is possible to realize a method of processing of the signals of multiple-beam phased antenna arrays (PAA), based on coherent conversion of signals to the increased frequency of the microwave band with subsequent processing of the spectrum of space-time frequencies. It is convenient to consider such a system of processing signals at the output of a PAA as holographic, in which the hologram is formed at a matrix of parametric conversions by signal waves and reference pumping waves. Because the signal frequency and pumping do not equal one another, it is then possible to refer such a hologram as a heterodyne. After a spatial Fourier transform, which is accomplished by a lens, "intensification" of the heterodyne in a matrix of mixers is realized by reconstruction of the image of the radio object at intermediate frequency. A method is described

which makes it possible to obtain the necessary relationships which describe the special features of processing of various signals, including wide-band, by holographic devices. Consideration of the system of processing as holographic makes it possible with the aid of well-developed procedures to obtain expressions for the characteristic parameters of such a device. Figures 1; references: 1 Russian.
[324-6415]

UDC 621.394.6

MULTIPLEXER FOR TRANSMISSION OF PLESIOCHRONOUS SIGNALS OVER COMMUNICATION CHANNELS

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 16 Jul 79)
pp 35-39

ANDRIYASH, N. F., VARFOLOMEYEV, A. N. and GOMEL'SKIY, A. S.

[Abstract] The design of a multiplexer for transmission of plesiochronous signals by the staffing method is analyzed, the total number of channels being determined by the transmission capacity C of a discrete group channel and the nominal transmission rate B (approximately $n = \frac{C}{B} - 1$ when $n \le 20$). Low-frequency phase flicker in such a transmission system can be suppressed by automatic frequency tuning, which involves a count and a synthesis at the receiver station of the frequency of the plesiochronous input signal according to the periodicity of the arriving staffing commands. The amplitude of the phase flicker must be determined first, before it can be reduced to a permissible level (±1%). The performance of such a system, the basis for multiplexer design, is calculated here by the geometrical method of triangulation in the frequency-time plane. Satisfactory operation of the system requires a large number of frequency gradation steps and thus a large number of stages. The resulting additional delay in data transmission must be minimized without increasing the phase flicker, which can be done by installation of a bank of adders connected in series and a frequency signal shaper at the receiver end. With such an automatic frequency tuning system it becomes unnecessary to increase the bandwidth of the additional communication channel in order to accommodate an auxiliary phase tracking and transmitting channel, which would result in a less efficient utilization of the discrete group signal flux and thus require more tone-frequency channels in secondary networks. Figures 6; references: 1 Russian.
[316-2415]

UDC 621.395.5:621.372.544

DESIGN OF TRANSMULTIPLEXER STRUCTURES

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 25 Nov 80) pp 47-52

GOL'DENBERG, L. M., MATYUSHKIN, B. D. and POLYAK, M. N.

[Abstract] The design of a transmultiplexer for particular transmission systems requires selection of a structure and calculation of its parameters, the structure consisting essentially of digital filters with auxiliary components such as permanent and internal memories. Here the designs of possible transmultiplexer structures are compared with respect to the normalized number of arithmetic multiplication operations per unit time (i.e., per channel in coupled system) as well as with respect to the complexity of synthesizing the digital filters in terms of components and size. First is considered the simplest transmultiplexer structure, for reversible coupling of an N-channel system with frequency division to one with time division and, accordingly, consisting of 2N digital filters with auxiliaries. Next are considered transmultiplexer structures with a fast-Fourier-transformation processor and a 2-stage modulation (demodulation), a multilevel transmultiplexer structure with real-variable signals consisting of 4N-2 digital filters with auxiliaries, and a multilevel transmultiplexer structure with complex-variable signals. The latter, although similar to one with real-variable signals, features better amplitude-frequency characteristics and simpler transfer functions. It also does not require different digital filters (with different amplitude-frequency characteristics and more intricate transfer functions) for forward and reverse conversion, as does the simplest transmultiplexer structure. It is therefore recommended, on the basis of the present state of the art, for 60-channel communication systems. Any multilevel structure can, furthermore, be simplified by the use of a multichannel nonrecursive digital filter with interpolation of signals or a multichannel nonrecursive digital filter with decimation of signals. Figures 12; references 7: 4 Russian, 3 Western.
[316-2415]

UDC 621.395.74

SOME PROBLEMS IN DEVELOPING THE UNIFIED AUTOMATED COMMUNICATION SYSTEM

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 pp 1-4

YUZZHALIN, A. S.

[Abstract] The paper briefly describes the contemporary state of development of the Unified Automated Communication System (YeASS), particularly with respect to successes of the 10th Five-Year Plan, and outlines the basic problems for the 11th Five-Year Plan. This plan provides for work on further improvement of a control system for a communication network; introduction into operation of a

switching system for networks of group circuits and wide-band channels; refinement and further development of the fundamental positions of the YeASS, taking account of the wide introduction of digital transmission systems, quasi-electronics, local and intermunicipal telephone switching stations, electronic centers for switching of telegraph communications, and introduction into operation of fiber-optical transmission systems and electronic automatic telephone exchanges.
During the years of the 10th Five-Year Plan, the Central Scientific-Research Institute of Communications (TsNIIS) together with the Scientific-Research Radio Institute (NIIR), the State Institute for the Surveying and Planning of Communication Installations (Giprosvyaz') and other organizations conducted basic investigations in which further development and refinement of the fundamental principles of creation of the YeASS were obtained.
[308-6415]

UDC 621.396.23

CONTINUOUS CONTROL OF RADIATED POWER OF TRANSMITTER IN RADIO LINE WITH SIGNAL FADING

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 (manuscript received 29 Apr 80) pp 38-40

PAKHOMOV, I. S. and POSTYUSHKOV, V. P.

[Abstract] During operation of a radio line with fading of signals, the power of the transmitter moves from the conditions of fulfillment of the specified requirements with respect to trustworthiness and reliability of communication. In the process for a large part of the time the radiated power of the transmitter considerably exceeds the value necessary for obtaining the required trustworthiness, i.e., an unjustified overexpenditure of an energy resource takes place. One of the methods of reducing energy cost is regulation of the radiated power of the transmitter in accordance with a change of the gain of the channel. The problem is solved in two works in the literature but the control algorithms developed in them are only correct for an ideal feedback channel. The authors present an algorithm of adaptive continuous control of the power radiation of a transmitter in a radio line with Rayleigh fading of signals, without loss of communication reliability. In contrast to ideal control of the radiated power of a transmitter, regulation of power with errors of measurement and a noisy feedback channel, which is accomplished without reduction of the specified reliability of communication, proves to be effective in cases where the condition of a channel is evaluated with high precision. Figures 2; references: 4 Russian.
[325-6415]

UDC 621.396.62

SUPERHETERODYNE RECEIVER WITH COMBINED PRESELECTOR

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81
(manuscript received after completion 20 Oct 80) pp 89-92

SARAYEV, S. M.

[Abstract] An analysis is made which leads to the structure of a preselector, new in comparison with those known. As a wide-band preselector, it is possible to use multicircuit filters for concentrated selection, monolithic piezoelectric filters, surface acoustic wave filters and others which make it possible to obtain a high steepness of a section of an amplitude-frequency characteristic with small dimensions. In order to use a combined preselector in a receiver with a very wide band, a twofold frequency conversion is necessary. It is shown that it is possible to divide the 1.5-30 MHz frequency band; the intermediate frequency and the heterodyne frequencies necessary during this are indicated. It is concluded that with an appropriate choice of the magnitude of the intermediate frequency and the limits of the sub-bands it is possible to replace part of the circuits of a tunable preselector by a wide-band filter of concentrated selection with fixed tuning and thereby to simplify the design of the radio frequency section of a superheterodyne receiver. Figures 1; tables 4; references 11: 10 Russian, 1 Western.
[325-6415]

UDC 621.396.235.4

INTERFERENCE IMMUNITY OF MULTIDIGITAL DISCRETE-DATA TRANSMISSION SYSTEM WITH DIGITAL PROCESSING OF SIGNALS

Moscow ELEKTROSVYAZ' in Russian No 6, Jun 81 (manuscript received 17 Jan 80) pp 39-42

ARSENT'YEV, V. G., ZUYEV, V. N., KVASHNIN, Ye. F. and KIRILLOV, N. Ye.

[Abstract] A high degree of interference immunity at the receiver end of multidigital discrete-data transmission systems is ensured by operation with ensembles of equal-energy orthogonal signals and by optimal processing of such signals in the receiver. Here the interference immunity of a receiver is analyzed by statistical simulation according to the Monte Carlo method, in the case of multiple-frequency-manipulation signals processed by the fast Fourier transformation and in the case of Walsh signals processed by the fast Walsh transformation. Curves of the error frequency are obtained in the course of simulation and the energy losses in quantization of an incoming signal as a random process are calculated, these losses being due to limiting and due to noise. They are found to be almost independent of the number of signals in an ensemble and can be minimized by optimal limiting of the (signal + noise) mixture to a level

proportional to their rms sum. Considered is also reception with erasure, in the case of a use of correcting codes, the same erasure threshold being acceptable for multiple-frequency-manipulation and Walsh signals. Figures 4; references 10: 4 Russian, 6 Western (3 in translation).
[316-2415]

UDC 656.254.15:621.395.37

EQUIPMENT FOR AUTOMATIC CHECKING OF LONG-DISTANCE AUTOMATIC TELEPHONE COMMUNICATIONS CHANNELS

Moscow AVTOMATIKA, TELEMEKHANIKA I SVYAZ' in Russian No 4, Apr 81 pp 9-12

TYURIN, V. L., professor, LIIZhT (Leningrad Institute of Railroad Transportation Engineers imeni Academician V. N. Obraztsov), doctor of technical sciences, D'YAKOV, D. V., docent, candidate of technical sciences, LEBEDINSKIY, A. K., assistant, candidate of technical sciences, LABETSKIY, V. L. and KOSHELEV, A. P., engineers

[Abstract] The significant increase of the number of channels of voice frequency and wide-band channels, organized with the aid of multichannel systems based on cable and radio relay lines, as well as the requirements for improvement of the quality of communications and the quality of service for subscribers has brought about the necessity for automatic checking of channels and routes on communication networks for railroad transportation. Work on automation of checking of the channels of various forms of communication has already started. One of its most important parts is the organization of automatic checking of the channels of long-distance automatic telephone communications (DATS) and creation of the corresponding equipment for automatic checking (AKK). Automatic checking makes it possible to conduct an objective verification of the condition of channels, to store statistical data, to free technical personnel from search for unsatisfactory channels, and to make it possible to give much consideration to preventive work. In the process a considerable economic effect is also brought about thanks to improvement of the use of a bunch of channels and a reduction of operating expenses for their maintenance. Calculations made by the authors show that with existing reliability of operation of the channels, the introduction of automatic checking with a repetition period of 1 hour, with a duration of checking of one channel of 20-30 second, gives an improvement in the use of the channels equivalent to the addition in each bunch of approximately 8% of the channels. Because of the elimination of manual labor during checking of the state of the channels with respect to the norms effective at present, the periodicity and the expenditure of time in the examination of each 100 channels at one communication center saves approximately 220 man-hours in a month. The special features of the organization of long-distance automatic telephone communications of railroad transport impose a number of specific requirements on automatic checking of channels and equipment intended for its realization. The following points are discussed in some detail: 1) Principal requirements for equipment; 2) Possibility of using existing Soviet and foreign equipment for automatic checking of channels

of DATS; and 3) State of development of equipment for checking DATS channels.
[315-6415]

FORECASTING DEVELOPMENT OF COMMUNICATION SECTORS IN THE CZECHOSLOVAKIAN SOCIALIST REPUBLIC

Moscow ELEKTROSVYAZ' in Russian No 4, Apr 81 pp 4-5

MAKOSHEVA, GABRIELA, CSSR

[Abstract] The special features of the communication sectors are listed in which they differ from other sectors and the national economy, and which must be taken into account when forecasting their development in the Czechoslovakian Socialist Republic. Each sector in the system of control of the national economy occupies an intermediate level, which makes it necessary during working out of the forecast to provide for a specific proportion and to assure interconnection with respect to a higher level of the hierarchy, other sectors of the national economy, and within the communication sectors. Problems are listed which must be solved in the long-range forecasting of the development of communications. Methods of forecasting are discussed. During working out of the forecast for each sector, two forms of information are fundamentally necessary: on the development of the total national economy and the increase of the necessities of the population, and the interior development of the sectors in question.
[308-6415]

PROTECTION FROM INDUSTRIAL RADIO INTERFERENCE

Moscow VESTNIK SVYAZI in Russian No 3, Mar 81 pp 22-23

LEONOV, V. A., candidate of technical sciences, head of Leningrad Division of Scientific-Research Radio Institute (LONIIR), and KALMAKOV, A. P., candidate of technical sciences, head of laboratory, LONIIR

[Abstract] The Leningrad Division of the Scientific-Research Radio Institute (LONIIR) is the leading enterprise in the struggle with industrial radio interference. Solution of this problem is based on a thorough technical and economical analysis of methods and means for insuring electromagnetic compatability (EMC). Work in the struggle with industrial radio interference is being conducted along the following lines: 1) Development of overall method of analysis of the EMC of radio facilities with industrial radio interference; 2) Methods of measurement, monitoring and fixing of standards of radio interference; 3) Development of a system of state-wide norms and standards for industrial radio interference; 4) Development and series output of special equipment used in monitoring of industrial production with respect to conformity to norms and standards as well as standard technological means of noise suppression; 5) Use of practical measures with respect to assuring EMC at stages of development, production, installation of equipment and construction of objects; and 6) Organization of a state-wide system of monitoring industrial radio interference for conformity to norms and standards. The system developed and effective in the USSR of norms and state standards for the permissible level of industrial radio interference is the most complete in the world. It encompasses all forms of industrial production and object-sources of industrial radio interference in the frequency band from 0.15 MHz to 12.5 GHz. The USSR is a member of the International Special Committee on Radio Interference and takes an active part in the development of international standards and recommendations. With the object of further modernization of noise-suppressing means, the LONIIR together with enterprises of the USSR Ministry of the Electrical Insustry developed a wide list of highly-effective filters intended for suppression of electromagnetic interference in the 10 kHz to 10 GHz frequency range. Organization of series output of these filters is an important problem. [322-6415]

PROTECTING TRANSMISSION SYSTEMS

Moscow VESTNIK SVYAZI in Russian No 3, Mar 81 pp 23-24

KLIMOV, M. A., candidate of technical sciences, Central Scientific-Research Institute of Communication (TsNIIS) and YERSHOVA, N. D., senior engineer

[Abstract] In recent years a fairly large experience has accumulated with respect to operation of communication lines located in the vicinity of radio transmitting stations. This made it possible to devise the "Manual on the Protection of Transmission Systems from the Interfering Effect of Radio Stations" which has replaced the earlier "Provisional Instructions with Respect to Planning Protection for Overhead and Cable Communication Lines from Interfering Effect of Radio Stations." The manual contains standards for permissible interfering voltages of noise in channels of transmission systems and assists operating enterprises in determining the initial data for planning protection of channels in one or another voltage. Missing data concerning a source of interference or the conductivity of the earth determine the course of investigation of the planning organization. A general-purpose formula for calculation of the interfering voltage in channels is discussed. Various methods for protection of transmission systems are considered. Figures 1. [322-6415]

NEW PRICE SYSTEM AT RADIO COMMUNICATIONS, RADIO BROADCASTING AND TELEVISION PRODUCTION ENTERPRISES

Moscow VESTNIK SVYAZI in Russian No 4, Apr 81 pp 37-38

KLYUKACHEVA, G. N., MIKHAYLOV, E. A. and SOKOLOV, A. L., colleagues of the Scientific-Research Radio Institute

[Abstract] In 1978-1980 the Moscow Division of the Scientific-Research Institute of Communications and the Scientific-Research Radio Institute conducted a regular review of prices for communications output. As a result, a new list of indices was worked out as well as new prices for determining the production volume of subsectors and communication enterprises, including the radio economy. The necessity for reviewing the prices in force was primarily caused by the following: 1) Under the effect of scientific and technical progress and improvement of the production organization, the production costs and fund capacity of production enterprises and communication subsectors change; 2) New forms of communication production appear; and 3) It was necessary to enhance the prices in force for an increase of the effectiveness of the quality of work. A long list of changes in the lists of indices and the system of prices at production enterprises of radio communication, radio broadcasting and television is presented.
[323-6415]

COMPONENTS AND CIRCUIT ELEMENTS, WAVEGUIDES, CAVITY RESONATORS AND FILTERS

UDC 534.284

NARROW-BAND MATCHED SURFACE ACOUSTIC WAVE FILTERS WITH REFLECTORS

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 10 Jan 79) pp 58-60

ZNAMENSKIY, A. Ye. and MURATOV, Ye. S.

[Abstract] In a 1978 paper, Znamenskiy and Muratov proposed a method of using surface acoustic waves for realization of narrow-band matched filters. In their present work a method of realization of matched filters is considered, which in comparison with traditional methods requires twice as small a duration of pulse response at the acoustic line. This is achieved with the aid of reflectors which are placed in each of the two cascade-connected units of the matched filter. In the process, the acoustic signal twice passes through one and the same section of the acoustic line. In comparison with the method of construction of matched filters discussed in the 1978 paper mentioned above, use of the reflectors makes it possible to reduce the overall dimensions of the acoustic line to a half, and in comparison with traditional methods--to reduce its longitudinal size to a fourth, with information transmission rates identical for all methods of realization of matched filters. A detailed explanation is given of the analysis and realization of the transfer function. Figures 2; references 5: 1 Russian, 4 Western.
[313-6415]

UDC 681.7.064:773.516.9

PRODUCING 'REVERSE GRIDS' FOR FILTERS USED IN THE LONG-WAVE INFRARED REGION OF THE SPECTRUM

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81 (manuscript received 10 Mar 80) pp 32-34

CHERNYAVSKAYA, N. A., IVANOVA, V. M., ZOLOTOVA, V. I., SMIRNOV, V. N. and FILIPPOVA, Ye. I.

[Abstract] "Reverse Grids" are thin metal elements of square or circular form, arranged in a determined order on a dielectric substrate transparent to the

long-wave infrared region of the spectrum. With respect to their geometry they are "reverse" as compared to "direct" grids, i.e., the opacity of the metalized parts of the first exactly coincides with the openings of the second. In the present paper investigations are described, as the result of which a method is developed for production by the photolithographic method of "reverse grids" with different configurations and various arrangements of the metal elements. Aluminized polyethylene terephthalate and polyethylene films are used as substrates. Use of polyethylene films is caused by the proposed procedure for modification of the polyethylene surface. Figures 3; references 12: 6 Russian, 6 Western (2 in translation).
[298-6415]

UDC 621.372.061.54

TAKING ACCOUNT OF LOSSES IN ELEMENTS OF TUNED FILTERS OF VALVE CONVERTERS

Kiev TEKHNICHESKAYA ELEKTRODINAMIKA in Russian No 5, Sep-Oct 80
(manuscript received 23 Jan 80) pp 34-40

TONKAL', V. Ye. and BEZGACHIN, N. I., Institute of Electrodynamics, UkSSR Academy of Sciences, Kiev

[Abstract] A method is considered for taking account of losses in the elements of tuned filters which are intended for a reduction of the higher harmonics in the current or voltage of valve converters. In order to take account of losses in the elements of two-terminal networks, realized on the assumption of an absence of losses in the first and second Foster forms, a series equivalent circuit of an inductance coil with losses and a parallel equivalent circuit of a capacitor with losses are investigated. Losses in the elements are taken into account with the aid of loss coefficients, the magnitudes of which are the reverse of the magnitudes of the Q-factor of the elements at the frequency of the first harmonic of the supply voltage. The proposed method does not require preliminary realization of the resistances of two-terminal networks, specified without taking account of the losses. It is only necessary to know which of the two Foster forms the two-terminal network will subsequently realize. Consequently, optimization of all the parameters of the filter, allowing for losses in the elements, is already assured at the approximate stage. Realization of the resistances of two-terminal networks is accomplished without taking account of losses by ordinary methods of synthesis. At the same time a filter constructed of elements with losses will have the themes, the characteristics of which were specified or obtained at the approximation stage. Figures 5; references: 11 Russian.
[277-6415]

UDC 621.372.542

REALIZING DIGITAL FILTER WITHOUT OPERATION OF EXPLICIT MULTIPLICATION

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81
(manuscript received after completion 16 Sep 80) pp 49-51

MINGAZIN, A. T.

[Abstract] Realization of the operation of multiplication in digital filters (DF) is combined with considerable equipment costs. Consequently, wide distribution has been obtained by a DF without the operation of explicit multiplication. The author considers the special features of such DF and their equipment realization. A block diagram of a DF of the second order is described, and an algorithm which corresponds to the DF is presented. On the basis of the circuit shown, a DF of the fourth order which uses Series 155 microcircuits is fulfilled. Figures 2; references: 5 Russian.
[325-6415]

UDC 621.372.543:621.37/39:54

EFFECT OF TECHNOLOGICAL ERRORS ON CHARACTERISTICS OF SURFACE ACOUSTIC WAVE BANDPASS FILTERS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 7 Aug 79) pp 463-469

SUCHKOV, S. G., ZASLAVSKIY, A. M. and LAZERSON, A. G.

[Abstract] Manufacturing errors are the most important factor in the industrial mastering of surface acoustic wave filters. The particular technological errors which influence the characteristics of the filters are the random variance in positioning of the pin and breaking of the pin. As a function of the equipment in use, the maximum deviation of the pins can vary in the interval of 0.1-1% from the period of the interdigital transducer (IT). The law of distribution of random deviations is close to normal. The occurrence of broken pins in the IT structure is connected with contamination of technological media and the atmosphere of the production setting. Consequently, the number of broken pins depends on the area of the IT and increases with a decrease of the width of the pin. Thus the problem reduces to an analysis of the high-frequency characteristics of the IT with non-uniformities of the structure distributed according to the random law. In order to solve this problem, the authors use the method of mathematical simulation of random magnitudes (Monte-Carlo method) utilized in a 1974 paper by A. G. Lazerson and others for analysis of systems with distributed interaction. The essence of the method is presented. The strong effect of defects of the structure on the amplitude-frequency characteristics of an IT is described. The experimental data obtained agree well with the results of a theoretical analysis. Figures 5; tables 1; references 4: 3 Russian, 1 Western.
[324-6415]

UDC 621.373.826:772.99

SYNTHESIZING COMPLEX SPACE-FREQUENCY FILTERS FOR A COHERENT-OPTICAL PROCESSOR

Leningrad IZVESTIYA VYSSHIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No 5, May 81 (manuscript received 14 Jan 80) pp 42-45

OCHIN, Ye. F.

[Abstract] A new approach to the theory of encoding of amplitude-phase wave fronts is proposed. The complex transfer function of a space-frequency filter of a coherent optical processor is given. An amplitude transparency is placed in the Fourier-plane of the processor, and several elementary phase modulators, e.g., a lens, prism, etc. are placed in direct proximity to the transparency. The transfer function of a synthesized filter is derived. The problem of encoding the transfer function reduces to selection of the phase modulators and to synthesis of an amplitude transparency, which minimizes the average error of encoding. The expression obtained here makes it possible to construct the simplest algorithm for solution of the problem. The paper was recommended by the Department (Kafedra) of Computing Techniques, Leningrad Institute of Precision Mechanics and Optics. Figures 1; references: 5 Western.
[314-6415]

UDC 681.34

POSSIBILITIES OF EMPLOYING PROBABILISTIC ROUNDING IN DIGITAL FILTERS

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian Vol 24, No 3, Mar 81 (manuscript received 12 Jan 80) pp 40-44

PETROVSKIY, A. A., Minsk Radio Engineering Institute, recommended by the Department of Computers

[Abstract] The output signal of a linear digital filter with a specified transfer function is realized as the solution of a difference equation. This equation is analyzed in order to determine the necessary and sufficient conditions for filter stability and the pulse response, so as ultimately to ascertain the possibility of using probabilistic rounding in such filters for the purpose of selecting the adequate bit capacity of a filter word, for which the impact of rounding errors is reduced while not increasing the word bit length of the intermediate results, although with a slight increase in the noise in the filter output product. An estimate of the noise from probabilistic quantization of the coefficients is used as the basis for determining their bit length. Two special cases are treated: 1) A first order digital filter; and 2) A second order filter. The analysis of these cases indicates the feasibility of probabilistic rounding, substantially simplifying the requisite special computers, something which is important in LSI technology, since ultimately, single place coefficients are possible where 0 or 1 have a probability of being chosen numerically equal to the determined coefficient; in this case, the digital filter remains contstant. Such an approach

reduces the capacity of the ultimate cycle because of the random nature of the coefficients and permits the selection of a definite filter word length. The paper was recommended by the Department (Kafedra) of Electronic Computers, Minsk Radio Engineering Institute. Figures 1; references 7: 6 Russian, 1 Western in translation.
[282-8225]

UDC 621.316.027.8.048

HIGH-POWER SEMICONDUCTOR SWITCH ON NANOSECOND BAND CONTROLLABLE BY LIGHT PULSE

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 81 (manuscript received 10 Oct 80) pp 45-47

VOLLE, V. M., candidate of technical sciences, VORONKOV, V. B., engineer, GREKHOV, I. V., dr of physicomathematical sciences, LEVINSHTEYN, M. Ye., candidate of physicomathematical sciences, SERGEYEV, V. G., engineer and CHASHNIKOV, I. G., candidate of physicomathematical sciences

[Abstract] The paper demonstrates the possibility of switching large currents by a single semiconductor element (reverse-biased semiconductor diode and thyristor) under the effect of a pulse of laser emission with a voltage at the switch $U_o \leqslant 5 \cdot 10^3$ V and a pulse current of approximately 15,000 A. The limiting possibilities are determined of solid state switches (maximum value of current and speed of its rise) in actual electrical circuits. The authors conducted experiments with two series-connected thyristor structures, each of which had $U_{o\ max} = 5$ kV, which confirmed the possibilities of series-connected switches on a basis of thyristorized structures with conservation of time and electric parameters. It is concluded that a thyristor switch controlled by a pulsed laser can serve as a basic element of power optoelectronics in the nanosecond band. Figures 3; tables 1; references 5: 3 Russian, 2 Western.
[317-6415]

UDC 621.318.5.001.24

CALCULATING PARAMETERS OF MIFISTOR DEVICES

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 2 Apr 80) pp 54-57

ZAKURDAYEV, A. V. and TUMANYAN, L. A.

[Abstract] A hydrocapillary mercury contact of a new type--the mifistor--has a number of advantages as compared with existing contact elements. The small and stable contact resistance, the absence of chatter and the liquid-metal nature of the contact makes it possible to reduce substantially the level of noise in

a switching network, to increase the reliability of establishing connections and to eliminate breakdowns because of "sticking" of the contacts. The lifetime of the first representative of the class of mifistor devices, the KMP-1, is equal to 15 years, which agrees with the lifetime of the majority of integrated microcircuits. The Moscow Engineering Physics Institute developed a mathematical method based on the classical laws of hydrodynamics of calculating the operational characteristics of mifistor devices. The results are presented of an experimental check of the results of this calculation, as well as the numerical values of the principal switching parameters of mifistor contacts. Figures 5; references 5: 4 Russian, 1 Western.
[313-6415]

UDC 621.318.12/13:621.318.5

MAGNETO-CONTROLLED SEALED-CONTACT REED RELAYS WITH ELASTIC FERROMAGNETIC ELEMENTS

Moscow ELEKTROSVYAZ' in Russian No 5, May 81 (manuscript received 19 Dec 79) pp 49-54

RABKIN, L. I., LEYZAN, L. I. and SHUL'MAN, S. M.

[Abstract] The development of telephone switching is based on the use of magnetic materials. One of a group of such materials is permalloy, an iron-nickel alloy. A combination of the magnetic and physical-mechanical properties of permalloy made it possible to create the magneto-controlled sealed-contacts--gerkons--which became the basic switching element of quasi-electronic automatic telephone exchanges. A number of items are described and their parameters are listed in the following tables: Table 1: Types of gerkons which have found use in magneto-controlled sealed-contact reed relays with elastic magnetic elements. Table 2: Soft magnetic elastic ferromagnetics--ferroelastics. Table 3: Relays of two types with ferroelastic flux supply, the RES and RGK (the RES is an electromagnetic weak-current relay; the RGK is a sealed-contact switching relay). Table 4: Curves of demagnetization and magnetic energy for four types of hard magnetic elastic ferromagnetics--magnetoelastics. Table 5: Relays with permanent magnets of Type MEB-4 magnetoelastic. More than 100 varieties have been developed of the above-mentioned relays for rated voltages of the windings of 5; 10; 12.6; 24; 27 V. Figures 5; tables 5; references: 15 Russian.
[313-6415]

UDC 621.372.8.049.75

RADIATION LOSSES FROM DEFECTS OF MATING OF TWO DIFFERENT DIELECTRIC STRIPLINE WAVEGUIDES IN THE MILLIMETER WAVEBAND

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 (manuscript received 19 May 80)
pp 68-73

MURMUZHEV, B. A.

[Abstract] In functional devices, on the basis of dielectric stripline waveguides as well as in elements of integrated optics, the necessity arises for the connection of two or more dielectric stripline waveguides both with different geometrical dimensions of the stripline and with different dielectric environments. In the case of such connections, pronounced irregularities originate in the contact surface of the junction in the form of sudden changes of the geometrical dimensions of the stripline or even the amount slowing down of the phase velocities of the waves E^x and E^y. This leads to additional losses caused by reflection of waves from the surface of the junction, as well as their direct and backscatter radiation from the irregularities of mating of the dielectric stripline waveguides. The present work furnishes the results of an approximate calculation, as well as experimental investigations in the 120-180 GHz frequency range of the losses at simulated defects of matings (transverse displacement of axis) of two different dielectric stripline waveguides which contain rectangular striplines which are arranged in substrates with a smaller dielectric constant than the stripline has. The author thanks V. V. Meriakr and V. F. Vzyatyshev for consideration of the work. Figures 3; references 9: 3 Russian, 6 Western.
[325-6415]

UDC 621.373.2:621.315.618.3/.9

EFFECT OF COMPOSITION OF AN SF_6-NITROGEN MIXTURE ON SWITCHING TIME OF ARRESTER IN THE NANOSECOND RANGE

Moscow ELEKTRICHESTVO in Russian No 6, Jun 81 (manuscript received 7 Feb 80)
pp 56-58

NIKIFOROV, M. G., engineer, Branch of VEI (All-Union Order of Lenin and Order of the October Revolution Electrical Engineering Institute imeni V. I. Lenin), Istra

[Abstract] The possibility is shown of calculating the switching time in mixtures of SF_6 [elegas] with nitrogen on the basis of the Weizal-Rompe formula. The value of the coefficient α is determined for various compositions of the mixture. With identical values of P [pressure of gas], d [length of discharge gap], the switching time in a mixture of SF_6 with nitrogen is $2 \div 3$ times less than with pure nitrogen and not larger than with pure SF_6. The composition of

the mixture with (10 ÷ 40%) SF_6 can be considered to be optimum (from the point of view of a small switching time) for use in arresters of the nanosecond range. The calculations given with respect to the expressions obtained for pulse fronts and maximum steepness agree with the experimental. Figures 3; references 9: 7 Russian, 2 Western.
[318-6415]

CONFERENCES, SEMINARS, EXHIBITIONS, SYMPOSIUMS

SCIENTIFIC CONFERENCE-SEMINAR OF HIGHER EDUCATIONAL INSTITUTIONS ON PROBLEMS OF FUNCTIONAL MICROELECTRONICS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
No 3, May 81 pp 111-112

KABANOV, D. A., candidate of technical sciences, docent, head of Department of Design and Technology of Production of Radio Equipment, Gor'kiy Polytechnical Institute imeni A. A. Zhdanov, deputy chairman, Organizational Committee of Conference-Seminar

[Abstract] The first Higher Educational Institutions Scientific Conference-Seminar on "Problems of Functional Microelectronics" was held from 28 to 30 May at the Gor'kiy Polytechnical Institute imeni A. A. Zhdanov by the Ministers of Higher Educational Institutes of the USSR and RSFSR, and by the Central and Gor'kiy Oblast Boards of the Scientific-Technical Society of Radio Engineering, Electronics and Communication imeni A. S. Popov. The Conference was devoted to a discussion of the condition and prospects for growth of fundamental and applied investigations in the field of theory and methods of development of functional microelectronics. The Conference was preceded by a Regional School Seminar on Functional Microelectronics conducted in 1975 by the Gor'kiy Polytechnical Institute and a Republic Conference on Functional Electronics conducted by the Kiev Polytechnical Institute in 1977 and 1979. Representatives of 18 municipalities of the country took part in the work of the Conference: 320 specialists from 31 higher educational institutions and 26 scientific-research organizations and industrial enterprises, including 4 members and corresponding members of the USSR Academy of Sciences, 18 doctors of sciences and 77 candidates of sciences. Altogether the plenary and sectional sessions of the seminar heard and discussed 164 papers and communications on the subject matter of the Conference, of which 12 papers were read at plenary sessions by leading scientists and specialists. The work of the Conference-Seminar proceeded in the following directions: 1) Physical basis of functional microelectronics; 2) Theoretical basis of functional microelectronics; 3) Optimization and machine planning of functional microelectronics devices; 4) Principal directions of functional microelectronics; 5) Survey of the characteristics of materials and the parameters of functional microelectronic devices; 6) Functional microelectronic devices; and 7) Technology of production of functional microelectronics devices. The titles are given a number of the papers presented at the Conference-Seminar. The principal directions of

scientific-applied investigations to be conducted in the field of functional microelectronics are also listed.
[268-6415]

SCIENTIFIC-TECHNICAL SEMINAR 'ELEMENTS WITH NEGATIVE RESISTANCE IN RADIO RECEIVING EQUIPMENT'

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 p 92

BIBERMAN, L. I.

[Abstract] A seminar was conducted on 26 September 1980 at the Exhibition of Achievements of the National Economy of the USSR, of the Sections of Radio Receivers and Amplifiers with the Central Board of the Scientific-Technical Society of Radio Engineering, Electronics and Communications imeni A. S. Popov (NTORES). Specialists from scientific-research institutes, design bureaus, higher educational institutes and representatives of the electronics industry took part. Thirteen reports were heard concerning new investigations and developments in the field of semiconductor elements with negative differential resistance (negatron) and devices fulfilled on their basis. Much interest was given to a communication by specialists from Dnepropetrovsk concerning negatrons from a chalcogenide glasslike semiconductor, and Gunn diodes. During consideration of the reports the practical direction of the work fulfilled was noted. In addition, the necessity was indicated for improvement of the technology of production of negatrons for series output of elements with parameters corresponding to the requirements of prospective developments of native instrument building.
[325-6415]

SECOND ALL-UNION SYMPOSIUM 'NONLINEAR DISTORTIONS IN RECEIVING-AMPLIFYING DEVICES'

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 pp 93-94

VAKSER, E. B.

[Abstract] The seminar took place at Minsk in September 1980. It was organized at the initiative of the USSR Ministry of Higher Educational Institutions (Minvuz SSSR), the USSR Ministry of the Communication Equipment Industry (Minpromsvyaz'), and the Central and Belorussian Boards of the Scientific-Technical Society of Radio Engineering, Electronics and Communications imeni A. S. Popov (NTORES). The object of the symposium was consideration of the results of the most significant work done in the field of nonlinear distortions in receiving-amplifying devices in the 10th Five-Year Plan, development of the most promising directions of proposed investigations, and development of recommendations for determination of problems which must be solved in the 11th Five-Year Plan. At the plenary and sectional sessions, 126 reports were heard. In the work of the sections, 200 persons from 30 cities took part. The activities of the four sections which were in operation at the symposium are described.
[325-6415]

UDC 534.232

TECHNOLOGY FOR PRODUCING SURFACE ACOUSTIC WAVE TRANSDUCER BY ENGRAVING POLYMER FILMS

Leningrad IZVESTIYA VYSSHIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No 5, May 81 (manuscript received 22 Jan 80) pp 93-96

SEVAST'YANOV, A. G.

[Abstract] Two 1971 papers from the literature describe the technology of producing surface acoustic wave (SAW) transducers obtained by engraving the metallized surface of quartz plates. The basic shortcoming of this method of preparation lies in the fact that during production of SAW transducers, the surface of the mechanically soft piezomaterials may be damaged and their repeated use is hindered. In addition, this method is unsuitable in the case where the metallized layer deposited on the surface of the piezomaterial with a low quality of polishing has a high mechanical strength. The present paper describes a new method of producing SAW transducers which has all the advantages of the first method, but is free from the shortcomings mentioned. It resembles photolithography, in which a difficult technological operation (obtaining a phototemplate) is eliminated, and an image of the electrodes on photoresist is achieved by the engraving method. A substrate of piezomaterial is metallized in a vacuum by a metal (e.g., nickel) which has high adherence and mechanical strength. If necessary a second layer of metal with good electrical conductivity is deposited. Subsequently on the substrate (in a centrifuge or by immersion is photoresist a thin layer (0.8) micrometer) is deposited of polymer film which polymerizes in a thermostate. Further, with the aid of a PMT-3 device (for determining the microhardness) an engraving is made of the polymer foil by a rectangular diamond pyramid. The pyramid has an angle at the top of 136° and a radius of curvature at the top of ~0.4 micrometer. The pattern required for the interdigital transducer of the SAW is obtained by movement of a coordinated stand (with the aid of a microfeed) The paper was recommended by the Department (Kafedra) of Experimental Physics, Leningrad Technological Institute imeni Lensovet. Figures 3; references: 2 Russian.
[314-6415]

UDC 621.314

DESIGNING PRECISION CONVERTERS WITH PROGRAMMED FORM OF OUTPUT VOLTAGE

Kiev TEKHNICHESKAYA ELEKTRODINAMIKA in Russian No 5, Sep-Oct 80
(manuscript received 3 Jan 80) pp 49-55

GUSEV, S. I., SEN'KO, V. I., SMIRNOV, V. S. and TOROPCHINOV, Yu. K., Kiev
Polytechnical Institute

[Abstract] Synthesis of transformer-key final control structures with pulse-code modulation is considered. Their use as the final control elements of frequency converters make it possible substantially to increase the technical-economical indices of the converters. The structure considered makes it possible to produce an output voltage of any form, including direct-current voltage, with an assigned precision. Employment of digital stabilization makes possible its use in precision voltage converters, during which there is a constant harmonic structure of the output voltage. However, as is shown, the possibility also exists of analog stabilization. The structure has high mass-dimension indices. The structure considered can be used as the final control element of automated control systems, precision electric drives and frequency converters of autonomous power supply systems. Figures 4; references: 8 Russian.
[277-6415]

UDC 621.314.572

NONCONTACT INTERRUPTER OF BREAKDOWN CURRENT OF THYRISTORIZED INVERTER

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian
No 2, Feb 81 (manuscript received 2 Jun 80) pp 92-95

DEMIDOV, S. L., candidate of technical sciences, docent

[Abstract] Breakdown processes in thyristorized inverters which convert direct current into alternating are characterized by the speed of buildup of a breakdown current, which requires use of extremely high-speed protective means, to the number of which pertains a noncontact interrupter which uses the principle of capitance suppression of the current. In order to reduce surges at the capacitor in these devices, the input inductance of the inverter is shunted by an additional thyristor. However, this complicates the protective system of the inverter and adversely shows up in its reliability. An analysis is made of the electromagnetic processes in a circuit developed by the author for an interrupter of the breakdown current of an inverter. It is shown that a reduction of surges at the commutating capacitor is assured by introduction of a diode without use of a shunting thyristor. Optimum results were given by a choice of the ratio of the inductance L_2/L_1 close to the magnitude n_{lim} for the specified values I_{0*} and U_{c_0} (voltage

of capacitor). The paper was submitted by the Department (Kafedra) of Electrical Engineering and Electric Drive, Moscow Order of the Red Banner of Labor Engineering-Construction Institute imeni V. V. Kuybyshev. Figures 4; references: 2 Russian.
[269-6415]

CRYOGENICS AND SUPERCONDUCTIVITY

UDC 621.3.013.22

CALCULATING MAGNETIC FIELD NEAR A DOUBLY-CONNECTED AXIALLY SYMMETRIC SUPERCONDUCTING BODY

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 4, Apr 81 (manuscript received 22 Jan 80) pp 360-362

CHERNOMORSKIY, ALEKSANDR ISAYEVICH, candidate of technical sciences, docent, Moscow Aviation Institute and PLEKHANOV, VYACHESLAV YEVGEN'YEVICH, senior engineer, Moscow Aviation Institute

[Abstract] A method is presented for calculating the magnetic field near a doubly-connected axially symmetric superconducting body. The calculated scheme of the electromagnetic system is illustrated. The problem of calculation reduces to determination of the surface distribution of electrical currents with a density J and to the subsequent computation of the induction of the magnetic field. In order to determine the surface distribution of the density of current J, the condition is employed of permanence of the magnetic flux which has permeated the doubly-connected superconducting body. The above calculation makes it possible to solve a wider class of problems than the one presented in the literature. Figures 1; references: 3 Russian.
[329-6415]

UDC 621.317.619

DEVICE FOR AUTOMATIC RECORDING OF DEPENDENCE OF A CURRENT THROUGH A SUPERCONDUCTOR ON THE MAGNITUDE OF THE EXTERNAL MAGNETIC FIELD

Leningrad IZVESTIYA VYSSHIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No 5, May 81 (manuscript received 13 Sep 78) pp 31-34

LUKMANOV, V. S.

[Abstract] The author describes a proposed device for automatic recording of the dependence of a current through a superconductor on the magnitude of the external magnetic field. A block diagram of such a device is presented. A cryotron is

used as the object under test. However, it is possible instead to use any superconducting specimen in the form of a film, wire, foil, etc. Then, instead of the control film of a cryotron, a solenoid is connected which creates an external magnetic filed. The proposed device eliminates the laboriousness of the operation of constructing such characteristics point by point by processing the corresponding volt-ampere characteristics. The paper was recommended by the Department (Kafedra) of the Theoretical Basis of Electrical Engineering, Leningrad Polytechnical Institute imeni M. I. Kalinin. Figures 2; references: 4 Russian. [314-6415]

ELECTRICAL ENGINEERING EQUIPMENT AND MACHINERY: APPLICATIONS AND THEORY

UDC 621.3.015.5

DISCHARGE VOLTAGES OF NONCORONA AIR GAPS OF DIFFERENT CONFIGURATION AT HIGH FREQUENCY

Moscow ELEKTRICHESTVO in Russian No 6, Jun 81 (manuscript received 26 May 80) pp 59-61

ARONOV, M. A. and TARASOVA, T. N., Moscow Power Institute

[Abstract] The creation of high-voltage devices operating in the radio-frequency band requires knowledge of the discharge characteristics of their air insulation. The known experimental material includes data on a limited number of discharge gaps and the semiempirical relations which connect the discharge voltage with the frequency of the applied voltage relate to gaps with a uniform field. The present paper is concerned with a calculated determination of the dependences of the discharge voltage on the frequency (volt-frequency characteristics) of non-corona air gaps with a different degree of the nonuniformity of the electrical field in the interval between the first and second critical frequencies. On the basis of the condition of independence of the discharge, the effect of a positive space charge on the discharge voltage is considered. The density of this charge as a function of the voltage frequency is determined, and a method is proposed for calculation of more accurate volt-frequency characteristics of gaps with a non-uniform electrical field. A comparison of the calculated and experimental values of discharge voltage shows that the greatest disagreement between them does not exceed 7%, which can be considered entirely acceptable for practical calculations of the discharge voltages of air gaps of insulated construction. Figures 3; references 5: 4 Russian, 1 Western.
[318-6415]

UDC 621.3.078

ANTI-PARALLEL VELOCITY CORRECTION OF ELECTROMECHANICAL SYSTEMS

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian Vol 24, No 3, Mar 81 (manuscript received 15 May 79) pp 20-26

MAMEDOV, V. M.

[Abstract] The transfer function of a thyristor converter--DC motor system with two control loops (armature current and rotational speed) is written in terms of the acceleration correction parameters, the feedback factor for the rotational speed, the electromechanical drive, motor armature circuit and converter time constants, and the converter and motor transmission gains. The expression is simplified by the incorporation of a general speed correction factor and the assumption that the current loop is set up for a modulus optimum. The resulting transfer function is analyzed in order to estimate the dynamic behavior and determine the conditions for correction in the external loop with the internal loop optimized using a modulus criterion. The optimization is illustrated graphically with curves for the quality of the system dyanmics showing the trade-off between overregulation and system response time, as well as the amplitude-frequency response of the speed control loop and its transient response. The proposed technique is suitable for engineering calculations and eliminates the need for special devices, such as operational amplifiers. The treatment is purely theoretical, adducing neither experimental checks nor sample calculations. The paper was recommended by the Department (Kafedra) of Electrical Drives and Automation for Industrial Installations, Voronezh Polytechnical Institute. Figures 3; references: 4 Russian.
[282-8225]

UDC 621.313.8:621.3.049.75.001.4

PROSPECTS FOR DEVELOPING ELECTRICAL MACHINES WITH PRINTED AND STAMPED WINDINGS

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 81 (manuscript received 3 Dec 79) pp 42-45

ADAS'KO, V. I., candidate of technical sciences, MULYAR, V. A., engineer, RAYSIN, I. B., SIDOROV, O. P., candidates of technical sciences

[Abstract] The development of high-speed automatic control systems, follow-up systems, and systems of programmed control require the creation of motors, capable of a rapid response to a control signal, rapid pickup, good regulating characteristics as well as acceptable overall indices and high reliability. These requirements are most fully satisfied by a constant-current motor with flat printed windings (MFPW). Use of these motors, which are comparatively simple in construction, with excitation from permanent magnets, make it possible to obtain smooth control of the frequency of rotation over a wide range with a

high speed of operation. In comparison with other types of servomotors, the MFPW possess a number of properties which satisfy the requirements of contemporary electric drives. A list of these properties is presented. The USSR developed and is producing a series of servomotors with disk printed windings with a power from 5 to 500 W with a rated frequency of rotation of 3000 r/m. Motors of this series have an electromechanical constant from 5 to 30 millisecond, small rotation moment, and small (from 40 to 90 mm) axial dimensions. The process of producing multilayer printed and stamped windings is described. This description includes the following: 1) Flow chart of the process of manufacturing printed windings by the positive method; 2) Flow chart of technological sequence for obtaining metallized through hole in winding by positive method; and 3) Principal technological stages of production of cylindrical windings by stamping method. Figures 5; references 7: 5 Russian, 2 Western.
[317-6415]

UDC 621.313.13.01-251

MEASURING FLUCTUATIONS OF THE ANGULAR SPEED OF ELECTRIC MOTORS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 4, Apr 81 pp 35-38

INOZEMTSEV, I. M. and IVANOV, O. A.

[Abstract] The authors consider the special features of measurement of the statistical parameters (chiefly, the spectral density) of fluctuations of the angle of rotation of the rotor of low-power electric motors which are involved with a system of automatic control. The spectrum of the fluctuations of the phase of a signal from a transducer mounted on the shaft of a Type G-234 electric motor is experimentally obtained. An increase of the load on the motor shaft decreases the amplitude of the fluctuations of the angle of rotation of the motor at frequencies of 4-7 Hz, which correspond to the frequencies of "oscillation" of the motor, but does not eliminate fluctuations at higher frequencies and even leads to their increase. Thus measurement of the spectral characteristics of fluctuations of the phase of the signal of transducers mounted on the shaft of an electric motor facilitates analysis of the reasons which cause instability of the angular speed of an electric motor.
[272-6415]

UDC 621.313.13:537.228.1

PIEZOELECTRIC MOTOR

Moscow ELEKTRICHESTVO in Russian No 6, Jun 81
(manuscript received 4 Mar 80) pp 68-70

LAVRINENKO, V. V., candidate of technical sciences, VISHNEVSKIY, V. S., candidate of technical sciences, BOYCHENKO, O. L., NADKERNICHNYY, S. P. and SHULYARENKO, A. P., engineers, Kiev Polytechnical Institute

[Abstract] Information concerning piezoelectric motors (PM) is practically missing in the scientific literature, although study of it in the USSR began as long ago as 1964 at the Kiev Polytechnical Institute, where in 1975 a sector laboratory of piezoelectric devices was created. Basic information concerning PM is disclosed in a few authorship certificates and patents (one each USA, Great Britain, France, Canada; two, USSR), which contain numerous types of construction of the motors. The present paper is concerned with a characterization and description of the motor as a whole, remarking upon its special features and prospective use. The piezoelectric motor and its electromagnetic analogs are compared. At present, models of transportation means based on linear PM have been produced. Work on an investigation of PM has approached industrial introduction. The video-magnetic recorder "Elektronika-552" with a PM used as the straight forward drive of the driving shaft unit has been placed in series production, and development is complete of record players with piezoelectric drive. Production of piezoelectric units of a cassette magnetic recorder is being prepared. Figures 4; tables 1; references 15: 11 Russian, 4 Western in translation.
[318-6415]

UDC 621.313.39.001.24

REDUCED MOMENT OF INERTIA OF ELECTRIC MOTOR WITH DISK ROLLING ROTOR

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 81 (manuscript received 28 Apr 80) pp 28-31

POKROVSKIY, S. V., candidate of technical sciences and PETROV, I. I., engineer

[Abstract] The arrangement, the design elements, the principles of operation and the basic equations of a disk electrical motor with a roll rotor (EMRR) are considered in a number of works from the literature. However, among other problems, calculation of the moment of inertia of a rotor and determining its speed of response is still not completely solved. The authors present expressions for determining the moment of inertia of such a motor in the general case as a function of the structural parameters. It is shown that with identical maximum electromagnetic moments, the speed of response of a disk EMRR is K_J times higher than an ordinary motor, which is particularly valuable during use of a disk EMRR. Figures 3; tables 1; references: 6 Russian.
[330-6415]

UDC 621.313.333.001.4

EFFECT OF ECCENTRIC POSITION OF ROTOR AND ASYMMETRY OF PHASE CURRENTS ON MAGNETIC VIBRATION OF STATOR CORE

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 81
(manuscript received 11 Oct 79) pp 24-26

GECHA, V. Ya., engineer and POZNYAK, E. L., doctor of technical sciences

[Abstract] At present there is a considerable disagreement between the calculated and experimental values of the levels of magnetic vibration of the stators of asynchronous motors. These disagreements are particularly important for multipolar machines, during which at a double power supply frequency, the experimental magnitudes of the vibrations exceed as a rule the calculated and at audio frequencies this difference amounts to 20-30 db. Analysis shows that the cause of the disagreement consists first of all in the fact that in practice small node forms of oscillations develop which are not predicted by calculations made by traditional methods. The cause of the appearance of the small-node form of oscillation is obscure, but it is possible the cause may be mechanical nonsymmetry of the stator construction. It is fundamental to assume that the small-node form of oscillation can also give rise to a nonsymmetrical arrangement of the rotor in the hollow of the stator and nonsymmetry of the currents in the stator windings. In the present paper, the results are given of a calculated and experimental analysis of the effect of the above factors on the formation of the small-node form of oscillations. With the object of a clearer explanation of the contribution of these factors to the overall level of vibration, this question is investigated using as an example simplified calculations and experimental models on the basis of the core of the stator of a multipolar asynchronous motor of a quarter size, the winding of which is fed by a three-phase alternating current. Figures 4; references: 4 Russian.
[330-6415]

UDC 621.316.027.8.048

COMPOSITE CONSTRUCTION ON BASIS OF POLYURETHANE FOAM AND FIBER GLASS FOR EXTERNAL INSULATION OF HIGH-VOLTAGE EQUIPMENT

Moscow ELEKTROTEKHNIKA in Russian No 6, Jun 81
(manuscript received 6 Sep 79) pp 36-39

OSNACH, R. G., BOBRYASHOV, V. M., candidates of technical sciences, KONDAKOVA, T. V., YERMOLOV, S. B., engineers, and BERKUTOV, A. M., candidate of technical sciences

[Abstract] In a system of exterior insulation, the materials used must simultaneously assure high thermal resistance as well as stability of the electrical and mechanical indices during prolonged action of climatic factors and electrical voltages. One of the possible ways of solving theproblem of insulation for such purposes is the creation of composite structures of the "sandwich" type with an

adhesive connection between layers, in which each layer carries a specific functional load, i.e., it warms, strengthens or protects from atmospheric corrosion. An analysis of deficiencies of materials, technological effectiveness and the possibility of manufacture of insulation in large quantities at USSR plants shows that already such a version of insulation can be fulfilled on the basis of polyurethane foam and fiber glass. The authors of this paper worked out and investigated electrical insulation composite construction on the basis of polyurethane foam SISPUR and corrugated polyester fiber glass for construction purposes. Composite construction can be prepared by two methods: continuous or standing. In the case of the authors, fabrication was performed by the standing method. The principal arrangements of the technological process of fabrication are presented. The present work is concerned with an evaluation of the serviceability of composition construction during exposure to water, increased humidity and natural climatic factors. After investigations applicable to a concrete system of exterior insulation, taking account of its actual dimensions and levels of acting loads, it was determined that composition construction on the basis of polyurethane foam and fiber glass can be used in high-voltage equipment for external performance, primarily in pulse voltage generators. Figures 5; tables 2; references: 4 Russian.
[317-6415]

UDC 621.316.174:629.13

ELECTRIC POWER QUALITY OF AIRBORNE ELECTRICAL SUPPLY SYSTEMS AND WAYS TO IMPROVE IT

Moscow ELEKTRICHESTVO in Russian No 6, Jun 81 (manuscript received 18 Sep 79) pp 32-36

BERTINOV, A. I., doctor of technical sciences, MIZYURIN, S. R., doctor of technical sciences, REZNIKOV, S. B., BOCHAROV, V. V., candidates of technical sciences, and ALESHECHKIN, V. A., engineer, Moscow Aviation Institute

[Abstract] The paper is concerned with a classification of the principal quality indices of the electrical energy of airborne systems of electrical power (ASEP), with the following special features taken into account: the strictness of definition (formula); relations of quantitative estimate; maximum mutual limitation of indices and an unambiguous agreement between quality indices and causes for their decline. The proposed system of indices is presented along with their quantitative estimate and the causes of their decline. The following conclusions are made: 1) During selection and planning of devices for improvement of the quality of electrical energy for ASEP, preference must be yielded to multifunctional devices, making it possible to affect several quality indices. 2) The most effective centralized measures for increasing the quality of the electrical energy of ASEP are improvement of the parameters of construction and systems of control of the main generator and parallel connection of a damping transducer, and by local measures, series-connection of parametric type converters or with intermedial storage of power. Figures 2; tables 1; references: 6 Russian.
[318-6415]

UDC 621.316.542.001.4

PREVENTING CONDENSATION OF MOISTURE IN ELEGAS ELECTRICAL EQUIPMENT

Moscow ELEKTROTEKHNIKA in Russian No 4, Apr 81 (manuscript received 1 Nov 79) pp 48-50

ARAKELYAN, V. G., candidate of chemical sciences

[Abstract] Elegas (SF_6 gas) equipment, intended for operation in open areas, requires particular attention with respect to assuring a low moisture content, which under specified conditions can condense and leads to arcing over the solid insulation of the equipment. The overall quantity in the equipment is the total quantity of water introduced with elegas, on the walls of the equipment, with air remaining in the equipment, with insulating materials and diffused by and with zeolite. The comparative value of the contribution of each of these sources, obtained on the basis of a calculation is presented in a table, from which it is seen that it is necessary to consider elegas, insulation material and diffusion through condensation as the basic sources of water in the equipment. An equation is derived which is basic to a solution of the condition for prevention of condensation. The problem consists of the following: to determine the quantity of adsorbent which must be placed in the elegas equipment in order that the moisture of the gas under all conditions of operation of the equipment be found at a level corresponding to the temperature of condensation at 20°C below the daily mean. Figures 1; tables 1; references 8: 3 Russian, 5 Western.
[330-6415]

UDC 621.317.38.045.6.001

EXPERIMENTAL INVESTIGATION OF ELECTROMAGNETIC PARAMETERS OF CURRENT-CARRYING COILS OF NARROW STEEL STRIP

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 4, Apr 81 (manuscript received 18 May 79, after completion 6 May 80) pp 367-373

OSTREYKO, VLADIMIR NIKOLAYEVICH, candidate of technical sciences, docent, Northwest Correspondence Polytechnical Institute and CHERNIKOV, YURIY L'VOVICH, candidate of technical sciences, docent, Northwest Correspondence Polytechnical Institute

[Abstract] The results are presented of experimental investigations of the electromagnetic parameters of coils of narrow steel strips as equivalents for combined windings--magnetic circuits. The procedures and means of conducting the experiments are discussed in detail. Part of the work on the narrow steel strips was done at the laboratory of the Department of Electrical Machines, Leningrad Order of Lenin Polytechnical Institute imeni M. I. Kalinin. Data on measurements and calculations are presented in 5 tables. The results of the

investigations are discussed and it is concluded that under specified conditions, combined windings--magnetic circuits are characterized by an acceptable level of incremental losses and a comparatively small leakage inductances. Use of such windings reveals widespread possibilities for increasing the use of active materials and saving of copper. Further experimental investigations with the object of a study of the effect of an external field on the electromagnetic parameters of the winding, as well as theoretical investigations with respect to the creation of effective methods of calculating these parameters are necessary for the successful use of combined windings--magnetic circuits. Figures 3; tables 5; references 20: 17 Russian, 3 Western.
[329-6415]

ELECTROACOUSTICS

UDC 534.6.08:621.317.743.5

MEASURING SENSITIVITY OF ACOUSTIC RECEIVERS IN DAMPED MEASURING VOLUME

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 4, Apr 81 pp 47-49

BARON, S. B.

[Abstract] Requirements are formulated for the ratio of dimensions and directivity of the radiating elements of acoustic devices being tested and calibrated, and the fidelity of reproduction. Reasons are given for the choice of a method of measuring in a damped volume with use of a continuous audio signal as a function of the conditions of the tests, the frequency band, and the characteristics of the measuring devices and the labor input. References: 2 Russian.
[272-6415]

UDC 534.232

REPRESENTATION OF LOADED PIEZOELECTRIC PLATE BY SIMPLIFIED EQUIVALENT CIRCUIT

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
No 3, Mar 81 (manuscript received 21 Sep 79) pp 74-78

YURCHENKO, A. V.

[Abstract] A number of works in the literature are concerned with the problem of the possibility of approximating the input characteristics of a loaded piezoelectric plate by an equivalent circuit with lumped parameters in a wide (>30%) frequency band. However, these works do not consider certain effects which are observed during use of a transducer with a large coefficient of electromechanical coupling. The present paper investigates the question of the possibility of representation of a transducer by a simplified equivalent circuit in the case where it is impossible to neglect the above effects. On the basis of various data, it is concluded that use of the simplified equivalent circuit for analysis of electrical signal conversions in acoustics is possible and useful if its parameters take account of the acoustic lead by calculated or experimental means. Use of the simplified equivalent circuit for determination of the parameters of

a piezoelectric is inadvisable. In order to check the assumptions expressed, a measurement was made of the input conductivity of an experimental specimen of an acoustical modulator based on fuzed quartz, with a converter of longitudinal waves of $LiNbO_3$ (K_t = 0.5) welded to an acoustic line by the method of a diffusion vacuum welding. The experiments conducted completely confirmed the conclusion that use of the simplified equivalent circuit for transducers with large K_t is possible only if the concrete conditions of their operation are taken into account. Figures 1; tables 1; references 5: 4 Russian, 1 Western.
[268-6415]

ELECTROMAGNETIC WAVE PROPAGATION, ELECTRODYNAMICS

UDC 538.311

MAGNETIC FIELD OF CYLINDRICAL CURRENT LAYER

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 4, Apr 81 (manuscript received 28 Jan 80) pp 355-359

TSEYTLIN, LEV ALEKSANDROVICH, doctor of technical sciences, scientific worker, Leningrad Electrical Engineering Institute

[Abstract] During the execution of various electromagnetic calculations the necessity appears to determine the magnetic field of currents, discretely or continuously distributed on a surface. In order to solve this problem in the general form, it is advisable to consider it as a boundary value problem for a Laplace equation, which outside of the region occupied by the currents satisfies the scalar potential of the magnetic field. In the present work, this method of solution is used for the case of currents flowing through a cylindrical surface of radius R at a section of finite length $\int = 2\alpha$; inside and outside the surface $r = R$ is assumed to be uniform and its magnetic permeability does not depend on the field voltage H. Figures 3; references 3: 1 Russian, 2 Western.
[329-6415]

UDC 538.552

THIN-WALLED CONDUCTING CYLINDER IN VARIABLE FIELD OF TWO-WIRE LINE

Novocherkassk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ELEKTROMEKHANIKA in Russian No 4, Apr 81 pp 363-366

KAZNACHEYEV, BORIS ALEKSANDROVICH, candidate of technical sciences, docent, Leningrad Mechanical Institute and POGROMSKAYA, LYUDMILA FEDOROVNA, candidate of technical sciences, docent, Leningrad Mechanical Institute

[Abstract] A solution is presented for a problem concerned with the diffraction of an electromagnetic field of a two-wire line at a conducting nonferrite ($\mu = 1$) cylinder, the thickness of the wall of which is $t \leqslant k^{-1}$ where k is the wave number of the material of the cylinder. The active and reactive resistance

and inductance inserted into the line is determined and investigated. A problem such as this is encountered, for example, during planning of inductive transducers. Figures 2; references: 1 Russian.
[329-6415]

UDC 621.316.362.018.782.3

CALCULATING ELECTROMAGNETIC FIELD OF SHIELDED CONDUCTORS IN TRANSIENT CONDITIONS

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 2, Feb 81 (manuscript received 2 Jun 80) pp 3-8

GERASIMOVICH, A. N., candidate of technical sciences, docent, and BULAT, V. A., engineer

[Abstract] A numerical method is proposed for calculation of the electromagnetic parameters of the field of shielded complex conductors in transient conditions. The calculations are based on the simultaneous solution of a system of equations of the field and the equations of the electrical circuit. It is assumed that the electromagnetic field in the conductor shields is plane-parallel, the radiuses of the shields differ negligibly from the average radius, and their length is by far greater than the space between them. The nonlinearity is taken into account of the characteristics of current-limiting reactors and the nonzero initial conditions. The calculations show that taking account of the nonlinearity does not cause significant qualitative and quantitative differences in the parameters of the electromagnetic field of the shields in comparison with the parameters calculated with constant inductive reactances. The paper was submitted by the Department (Kafedra) of Electrical Stations, Belorussian Order of the Red Banner of Labor Polytechnical Institute. Figures 3; references 6: 4 Russian, 1 Polish, 1 Western.
[269-6415]

UDC 621.373.826:525.7

THERMAL DISTORTIONS OF LASER BEAM IN THE ATMOSPHERE

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 4 Feb 80) pp 627-631

GORDIN, M. P., SADOVNIKOV, V. P. and STRELKOV, G. M.

[Abstract] Estimates of the magnitude of thermal distortions which take place during propagation of a beam from the earth's surface up to the lower edge of clouds are of interest. In the present brief communication estimates are made on the basis of a numerical solution of the problem of thermal self-stress of a collimated Gaussian beam (λ = 10.6 micrometer), propagating with respect to a

vertical atmospheric path. It is also shown that a transition to an oblique path considerably decreases the illuminating ability of the beam. On the basis of the results of a numerical investigation of the propagation of a laser beam in a layer of the atmosphere at heights up to 3 km, the authors conclude: 1) The atmosphere can lead to a significant thermal distortion of the laser beam, which increases in the summer time and with a transition from vertical paths to oblique; 2) In estimates of the power necessary for illumination of a cloudy layer by a laser beam it is necessary to take into account distortion of the beam inserted by a subcloud layer; and 3) Study of methods for increasing the illuminating ability of the beam at the level of a clouded layer with its specified power. Figures 5; references 15: 7 Russian, 8 Western.
[324-6415]

ENERGY SOURCES

UDC 621.313.12:538.4

INVESTIGATING THERMAL MECHANISM OF INTERELECTRODE BREAKDOWN IN MAGNETOHYDRODYNAMIC GENERATORS

Kiev TEKHNICHESKAYA ELEKTRODINAMIKA in Russian No 5, Sep-Oct 80
(manuscript received 12 Dec 79) pp 15-21

BYSTRYY, A. I., GANEFEL'D, R. V., MAZUR, N. I., MIROSHNICHENKO, A. A. and NALETOV, V. V., Institute of Electrodynamics, UkSSR Academy of Sciences, Kiev

[Abstract] Previous experiments from literature concerned with the electric strength of the interelectrode gap of ENIN-2 and Mark-6 magnetohydrodynamic generators (MHD) are described. Investigations conducted by the authors of the thermal mechanism of an interelectrode breakdown in a MHD are presented. The experiments in this case were conducted on a K-1 installation in induced and applied electrical fields. An approximate theory is proposed for calculation of the parameters of a thermal breakdown of an interelectrode gap of various widths. With a temperature of the insulating wall above 1600 K, there is good agreement between the theoretical and experimental results obtained with the K-1 MHD installation. Below this temperature the role of an electrical breakdown increases. With the width of the gap less than 10 mm, the breakdown in an applied field chiefly takes place with respect to the plasma, and with the width of the gap greater than 10 mm, the dielectric. It is shown that one of the significant factors of an interelectrode breakdown is the level of fluctuations of the electrical field. With the presence of fluctuations the breakdown voltage and the breakdown time is markedly decreased. Figures 5; references 10: 4 Russian, 6 Western.
[277-6415]

UDC 621.384.326

INFRARED IMAGER FOR INVESTIGATING EARTH'S NATURAL RESOURCES

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81
(manuscript received 24 Jul 80) pp 27-29

PERLOV, V. V., KRASNIKOV, D. N., SERGEYEV, V. P., UKHOV, B. V. and
YASINSKIY, G. I.

[Abstract] The paper describes a two-channel infrared imager developed on the basis of the results of the theoretical and experimental investigations conducted by Ye. Ya. Karizhenskiy and others (OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST', 1979, No 1, p 18), in which the block diagram and optical train used during designing of the infrared imagers "Teplo-4" and "Vulcan" are shown. However, when they were created, the concrete technical solutions of these two aircraft infrared imagers differed from one another. The present paper considers some of the special features in the construction and circuit of the "Vulcan" which simultaneously operates in the two spectral regions 3.8-5.2 and 8.0-13.5 micrometer. Problems of further improvement of infrared imagers are discussed. Figures 3; references: 5 Russian.
[298-6415]

INSTRUMENTS, MEASURING DEVICES AND TESTERS, METHODS OF MEASURING, GENERAL EXPERIMENTAL TECHNIQUES

UDC 53.082.53:620.191.4

INVESTIGATION BY ELLIPSOMETER METHOD OF SURFACE OF OPTICAL MATERIALS AFTER MECHANICAL PROCESSING

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1,
(manuscript received 4 Mar 80) pp 60-61

VLADIMIROVA, T. V., MASLOV, V. P., ODARICH, V. A. and SKACHKOV, M. M.

[Abstract] This paper describes an investigation by the ellipsometer method of the surface of optical materials after mechanical processing. Specimens investigated included glass ceramic, crystallized and fused quartz and TF1 glass units with a thickness of 10 mm. Investigations were also made of individual specimens of GLS22 neodymium glass. Measurement of the elipsometric parameters of the specimens of each material were made close to the Brewster angle. The minimum ellipticity measured at this angle served as the criterion for the surface quality. The experimental results of the investigation of these materials demonstrated that with chemically stable solid materials (quartz, glass ceramic), the magnitude of the ellipticity is decreased to a determined value in the case of an increase of the thickness of the polished layer. Because the ellipticity of an ideal surface under the given conditions of an experiment must equal zero, such a nature of its change indicates a decrease of the concentration of imperfections and an improvement of the quality of the surface reflection. Consequently, for the thickness of an imperfect layer it is possible to take the magnitude of the polished layer with which a constant value of the ellipticity is obtained. Further polishing does not improve the quality of the surface. It is shown that with identical processing, the imperfect layer on the surface of glass ceramic is smaller than on the surface of the crystallized quartz. For less solid and less stable glasses (TF1, neodymium), a reverse correlation of the ellipticity with the thickness of the layer removed is observed. On the basis of a comparative analysis of the results obtained from the investigation, it is concluded that the thickness of the affected layer depends on the mechanically processed material and the abrasive used. Figures 1; references: 3 Russian.
[271-6415]

UDC 53.088.3

INCREASING PRECISION OF MEASUREMENTS WITH ITERATIVE ERROR CORRECTION

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 4, Apr 81 pp 12-14

ALIYEV, T. M., DAMIROV, D. I. and SHEKIKHANOV, A. M.

[Abstract] As shown in the literature, iterative automatic correction of errors is an effective means which assures a high precision of digital measurement of analog magnitudes. The attainable precision in this case is determined by the precision of the set of reference standards for the magnitude being measured. One or another reference standard close to the value of the magnitude being measured is assigned with the aid of a particular digital code obtained after special processing of the results of analog-to-digital conversion of input and standard magnitudes. In the present paper, a procedure is described in which a digital-to-analog converter (DAC) is used as the set of reference standards. At present, creation of a highly-precise DAC does not encounter difficulties. Nevertheless, precision of measurement by the iterative method is limited by the precision of the DAC. Consequently, the paper proposes new principles of organization of the process of iterative correction of errors, which make it possible to increase the attainable precision of measurement. Figures 2; references: 2 Russian.
[272-6415]

UDC 539.123.089.6

MAXIMUM PERMISSIBLE ERROR OF REPRODUCTION AND TRANSFER OF UNIT SIZE OF ABSORBED NEUTRON RADIATION DOSE

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 4, Apr 81 pp 50-51

MARCHENKO, A. V. and MASLYAYEV, P. F.

[Abstract] Methods of evaluation of the dispersion of propagation of absorbed energy are considered. Although these methods are accurate for various magnitudes and are usable for different conditions of irradiation, the authors are only concerned with the particular cases of computation and measurement of the absorbed energy of neutrons. The maximum permissible error of reproduction and transfer of the size of a unit of an absorbed radiation dose is investigated. Figures 2; references: 3 Russian.
[272-6415]

UDC 621.317

METROLOGICAL PROVISION FOR MEASURING ELECTROMOTIVE PARAMETERS OF HIGH-FREQUENCY AND MICROWAVE MATERIALS IN CEMA NATIONS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 5, May 81 pp 63164

VASIL'YEV, A. I., CHERNOUSOVA, N. N. and YATSYNINA, N. L.

[Abstract] The combined work of the Siberian State Scientific-Research Institute of Metrology (SNIIM) and CEMA nations is described. This work is carried out both in the form of scientific-technical interchanges and by the creation of equipment through the efforts of several countries. As an example, SNIIM developed and the CEMA Standards Commission affirmed Recommendations for CEMA nations: MS 4577 "Means of Measuring Permeability of Ferromagnetics at Frequencies from 1 to 200 MHz. Check Circuits." The introduction of such recommendations makes it possible to maintain unity of measurements by members of CEMA.
[309-6415]

UDC [621.317.33.088:621.315.61]: [539.125.5 + 539.166.2]

MEASURING VOLUME RESISTANCE OF DIELECTRICS DURING PULSED GAMMA-NEUTRON IRRADIATION

Moscow ELEKTRICHESTVO in Russian No 5, May 81 pp 41-45

ZIL'BERMAN, M. I., candidate of technical sciences, and KOSTYUKOV, N. S., doctor of technical sciences, Moscow

[Abstract] In the electrical network of a circuit for measurement of the volume resistance of dielectrics irradiated by pulsed ionizing radiation, systematic errors of measurement appear which result from the effect of the irradiators, both on the specimen under test and on the part of the measuring cable line. Such errors of measurement can be investigated. The basis of an analysis of equivalent circuits for replacement of the electrical network with the use of conventional methods of calculation. In the present paper, four equivalent circuits are studied. Methods are presented for measurement of the volume resistance of a dielectric connected to two-electrode and three-electrode circuits, during the process of pulsed gamma-neutron irradiation (100-200 microsec). Figures 5; tables 1; references: 5 Russian.
[284-6415]

UDC 621.373.826

ESTIMATING PHYSICAL-CHEMICAL PARAMETERS OF SURFACE WATERS OF WATER AREAS WITH RESPECT TO MICROWAVE SELF-RADIATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 22 May 79) pp 624-626

GRANKOV, A. G., LIBERMAN, B. M. and SHUTKO, A. M.

[Abstract] The results of theoretical analysis and experiments reported in two 1978 papers coauthored by Shutko demonstrate that the method of microwave radiometry is an effective instrument for distant sounding of the physical-chemical parameters of media, in particular for determining the temperature, salinity and the presence of admixed inclusions. The present brief communication discusses investigations made at an unspecified time at the Order of the Red Banner of Labor Institute of Radio Engineering and Electronics, USSR Academy of Sciences, of the radiation characteristics of water areas with various concentrations of salt, and with the presence of chemical impurities. A complex of measuring equipment installed on IL-18 and AN-2 aircraft included radiometers at wavelengths from 0.8 to 30 cm. The fluctuation sensitivity of the equipment amounted to 0.3 to 1 K. Investigations of the effect of impurities on the radiation characteristics were conducted at an unspecified time in the Moldavian SSR and the Odessa Oblast. Questions of a quantitative estimate of the degree of chemical impurity by the microwave radiometry method requires further experimental investigation of the spectra of radiation of water basins with simultaneous monitoring of surface measurements. Figures 5; references 7: 5 Russian, 2 Western.
[324-6415]

UDC 621.375.826:535.584

MEASURING WAVELENGTH OF HIGHLY-STABLE LASERS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 5, May 81 pp 26-28

SOLOMAKHA, D. A.

[Abstract] A wave of laser radiation undergoing repeated reflections in a Fabry-Perot interferometer, with large time delays, continues to retain a high degree of coherency. Consequently, the interference pattern has an increased sensitivity to nonpara-lelism of the interferometer mirrors and misalignment of their illumination. In the present paper distortions of the interference pattern and errors of interference measurements are considered as well as the limitations imposed by them on the precision of measurement of the wavelength of highly stable lasers. Figures 2; references 12: 9 Russian, 3 Western.
[309-6415]

UDC 535.853.4:53.087.82

WIDEBAND FREQUENCY-MODULATED POLARIZATION INTERFEROMETERS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, Mar 81 pp 32-35

ZASTROGIN, Yu. F., candidate of technical sciences

[Abstract] The fundamentals of designing wideband frequency-modulated interferometric systems were investigated. The systems are divided into two groups, one with normally dropping optical signals of the reference and measuring arms of the interferometer and one with optical signals with variable frequency-modulation index. An integral equation is derived in order to calculate the variable component of the output electric signals of band filters. The useful spectral components that carry information are separated by band filters and the derived expressions indicate that the doppler shift frequencies of the output signals of band filters are less than the doppler shift of normally impinging radiation on different multipliers. The two systems under consideration differ in that systems with normally impinging optical singals are intended for operating in a range of rates restricted by the ratio between the carrier frequencies and the maximum doppler shift while systems with variable frequency-modulation index are intended for operation at high rates determined by the ratio among carrier frequencies, doppler shift and multiplier. The systems are useful in calibrating vibration-measuring equipment over a wide range. Figures 8; references: 4 Russian.
[283-6[illegible]21]

UDC 681.7.785.57.089.6

FABRY-PEROT INTERFEROMETER WITH SPHERICAL SURFACE ADJUSTMENT

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 5, May 81 pp 31-32

ABRAMOV, S. A. and TOMASHEVSKIY, Yu. F.

[Abstract] The authors investigate a Fabry-Perot interferometer with a separator in the form of a spherical hinged pair, the dimensions of the units of which are much less than the radius of the sphere. Locking of the hinged pair is accomplished by forces of the surface tension of a lubricating substance. The high stability and reproductibility of movement differences and the adjusted state make it possible to employ interferometers of the proposed design for solution of a wide range of applied problems of optics, spectroscopy and metrology. The sufficiently rigid adjustment design makes it possible to produce interferometers with a large movement difference (1 meter and more). Figures 2; tables 1; references: 6 Russian.
[309-6415]

UDC 681.785.57:535.853.22

MEASURING LASER WAVELENGTH WITH FIZEAU INTERFEROMETER

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 5, May 81 pp 30-31

POMERANSKIY, A. A., TOMASHEVSKIY, Yu. F. and TOROPOV, A. K.

[Abstract] The distinctive features of the procedure for measuring the wavelength of pulsed lasers with an error of measurements on the order of 10^{-6}-10^{-7} are considered and grounds are given for selection of a criterion for adjustment of an interference system on the basis of a theoretical and experimental investigation of the spatial structure of the interference field of the Fizeau multiple-wave interferometers. Figures 1; references: 4 Russian.
[309-6415]

UDC 681.112.65

TABLE-TOP ELECTRIC CLOCKS WITH RADIO CONTROLLED TIME CORRECTION AND PIEZOELECTRIC MOTOR

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian Vol 24, No 3, Mar 81 (manuscript received 13 Dec 79)

STRIZHAK, V. Ya. and KOKOVSKIY, I. Ya.

[Abstract] The following configuration is proposed for a table top electric clock with radio controlled time correction: a synchronous piezoelectric motor, driving either an analog or digital display, on which the actuating mechanism of the correcting device acts, where this correcting device is driven by a precise time signal source through a digital selector. The heart of the clock is a bimorphous piezoelectric element type motor. The piezoelectric element takes the form of two piezoelectric strip transducers secured to a common base joining them together, which is then mounted cantilever fashion on a fixed support. The application of a voltage to the transducers causes the composite piezoelectric cantilevel beam to bend. The oscillation frequency of the beam is proportional to the applied frequency. An expression for the travel of the free end is given and the following parameters are noted for lead zirconate titanate: free end step of 1.6 mm for a transducer of 50 x 10 x 0.5 mm. The mechanical design details and functioning of the correcting mechanism are described. The advantage of this type of clock over previous designs using conventional electric motors is the reduction in the power consumption from as much as 30 W down to 0.6 W, the low cost, minimum weight and small size. A simple expression is also derived for the overall operational reliability, indicating better reliability than its synchronous motor counterparts. The paper was recommended by the Department (Kafedra) of Precision Mechanical Devices, L'vov Polytechnical Institute imeni Leninskiy Komsomol. Figures 3; references: 4 Russian.
[282-8225]

UDC 681.785.557

DYNAMIC ERRORS OF SF-8 SPECTROPHOTOMETER

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 (manuscript received 17 Jan 80) pp 40-43

LAGUTIN, V. I.

[Abstract] Although the SF-8 recording spectrophotometer is widely used during quantitative spectral analysis, practically no consideration is given in the literature to its systematic errors. In particular, the dynamic errors of the instrument which originate during entry on a form of transmission spectra have not been evaluated. This problem is considered in the present work. Experimental amplitude-frequency characteristics (AFC) of the SF-8 are shown for three operating conditions of the recording system. Analytical expressions for the transfer functions of the recording system are derived, based on the experimental values of the AFC. The dynamic errors which appear at various speeds of scanning of spectral absorption bands of different widths are calculated and a comparison is made of the results obtained with the experimental values of the dynamic errors for a real absorption band. The data furnished can be used under certain conditions for an approximate evaluation of distrotions which appear during operation of other types of spectrophotometers. A method for a more precise evaluation of such errors is described. Figures 3; references 5: 4 Russian, 1 Western.
[271-6415]

MICROELECTRONICS

UDC 621.372.8.049.75

ELECTROMAGNETIC WAVE DISPERSION IN SOME TYPES OF LINES FOR MICROWAVE INTEGRATED CIRCUITS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 17 Dec 79) pp 470-480

LERER, A. M. and MIKHALEVSKIY, V. S.

[Abstract] The authors investigate the propagation of electromagnetic waves in the following screened four-layer transmitting lines: microstrip line; combined microstrip lines; slot lines; coplanar waveguide; and combined slot lines. Dispersion equations are obtained for these lines by the Galerkin method. The weighted polynomial of Chebyshev was selected as the base function, with the special features of the field close to the edge taken into account. Development of a program in the ALGOL-GDR language for a BESM-6 computer made it possible to calculate the constant propagation of the fundamental and higher types of waves in the indicated lines. Figures 6; references: 7 Russian.
[324-6415]

UDC 621.375.1

STATISTICAL ANALYSIS OF HYBRID INTEGRATED CIRCUITS OF BALANCED MICROWAVE BAND AMPLIFIERS

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81
(manuscript received after completion 26 Sep 80) pp 35-37

PETROV, G. V.

[Abstract] Machine methods are used for calculation of the hybrid integrated circuits of balanced microwave band amplifiers. Parametric synthesis, which is most widely used, makes it possible to determine only the parameters of an ideal balanced amplifier, which is rather difficult to realize because the spread of the parameters of the passive and active elements of the amplifier leads to a considerable divergence of the output characteristics from those required. As a

result the percentage of output of suitable balanced amplifiers is decreased. For a preliminary determination of the output parameters and the percentage of output, a statistical analysis is made on the basis of the Monte-Carlo method of the hybrid integrated circuits of balanced amplifiers. The sequence of calculations of the output characteristics is listed. The investigations conducted show that use of a statistical analysis of the output characteristics of balanced amplifiers makes it possible on the design side to determine the optimum variation of an amplifier with spread of the primary input parameters, which significantly decreases cost during their series output. Figures 3; tables 3; references: 7 Russian.
[325-6415]

UDC 621.382

CHECKING DEFECTS OF INTERNAL INSULATION OF ELEMENTS OF INTEGRATED CIRCUITS WITH THE AID OF LIQUID CRYSTALS

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81
(manuscript received 22 Nov 79) pp 252-254

ANDRIANOVA, O. I., KRAVTSOV, A. Ye and ROZHKOV, S. S., Institute of Physics, USSR Academy of Sciences

[Abstract] In order to increase the reliability and the output of suitable integrated circuits it is necessary effectively to check the quality of the dielectric isolation of integrated circuit elements. As shown in the literature, for an investigation of the imperfections of insulation layers in structures of the type semiconductor-dielectric a method is described which uses the effect of dynamic scattering of light in nematic liquid crystals (NLC). In the present work, silicon structures with dielectric isolation (SSDI) are investigated and a qualitative identification is made of the insulating oxide, on the base of the threshold nature of the electrohydrodynamic instability in a NLC. The SSDI investigated are polished semiconductor plates with a diameter of 30-40 mm with a matrix of monocrystals (300-400 elements)as a function of the dimensions of the plates. The Si monocrystals are insulated by a thin layer of oxide SiO_2 (1-2 micrometer) from substrates of polycrystalline silicon. Altogether 15 plates were investigated. The makeup of the NLC is described. It is concluded that use of the liquid crystal (LC) method assures express-speed nondestructive checking of the elements of a silicon structure with dielectric isolation and gives information concerning defects of the type under investigation. This makes it possible to use the LC method as a step-by-step method of checking during an industrial technological cycle which permits improvement of the technological preparation of devices and thereby to increase the percent of output of suitable integrated circuits. Figures 2; references 6: 4 Russian, 2 Western.
[270-6415]

UDC 621.382

TWO-CHANNEL DEVICE WITH CHARGE COUPLING

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81
(manuscript received 10 Dec 79) pp 254-258

KHAYNOVSKIY, V. I., LAVRENOV, A. A., BELYAYEV, S. N., RAKITIN, V. V. and
KRASOVSKIY, V. M.

[Abstract] Devices with charge coupling which contain several bulk information channels located one under another in the thickness of a semiconductor are promising for both development of photoelectric transducers on their basis, and for the construction of dynamic storage devices with a large information capacity. At present, only theoretical work is found in the literature, where a calculation is made of the basic electrical and optical parameters of such devices which are known as bulk devices with charge coupling (BDCC). The present work is concerned with the experimental results of an investigation of the charge transfers in two-channel BDCC. The device is a four-phase linear device with charge coupling which has up to 16 resolution elements in both the surface and bulk channels. Resolution occurs at each element via 4 transfer electrodes. The dependences are obtained of the output signals and the effectiveness of charge transfers of both channels on the operating conditions of the device. It is concluded that the results obtained confirm the possibility of producing multichannel bulk devices with charge coupling. Figures 5; references 4: 2 Russian, 2 Western.
[270-6415]

UDC 621.382.82

PROSPECTS FOR HIGH-SPEED BIPOLAR INTEGRATED CIRCUITS

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81
(manuscript received 17 Jan 80) pp 195-205

ORLIKOVSKIY, A. A., Moscow Institute of Electronic Techniques

[Abstract] A survey is made of contemporary achievements in high-speed bipolar and metal-insulated gate field effect (IGFET) large integrated circuits. The following items are discussed: 1) High-speed emitter-coupled logic unit based on transistors with a 1 x 1 micron emitter area; 2) High-speed multistage emitter-coupled logic circuits (MECLC); 3) Advantages added by use of Schottky diodes; 4) Advantages added by use of functional-integrated structures; and 5) Prospects for creation of large integrated circuits (LIC) for operation in systems with liquid low-temperature cooling. Prospects are evaluated for the development of high-speed bipolar digital LIC and the introduction of submicron technology; and, as a result, the use of circuitry which is optimum for the highest speed of operation. It is concluded that at present bipolar digital IC surpass IGFET circuits with respect to speed of operation, in spite of the fact that IGFET circuits have already attained a record-breaking short length of the channel

(~0.5 micrometers) and in bipolar circuits almost an order larger minimum dimensions in the crystal plane (3.5-4.5 micrometer) have been realized. A substantial (5-10 times) gain ahead of ECL elements (at the level of logical units) in speed of operation as well as in the number of transistors and resistors used assures use of MECLC. Use of Schottky diodes together with MECLC in logical units as well as in immediate-access memory circuits and development of transistors with a Schottky-type collector open new prospects for ultrahighspeed bipolar digital large integrated circuits. In large integrated immediate-access memory circuits based on bipolar transistors a combination of functional-integrating structures (e.g., I^2L and OR elements) is advisable in memory devices with ECL, emitter-coupled with Schottky logic barriers and multistage emitter-coupled with Schottky barrier logic circuits in units for control of memory devices. The probable direction of growth of bipolar technology is vertical integration, the possibilities of use of which in LIC are insufficiently used at the present time. The development of bipolar ultrahighspeed IC operating under conditions of liquid low-temperature (70-80 K) cooling shows promise, which makes it possible to increase the degree of integration and other indices of bipolar ultrahighspeed IC. Figures 5; tables 6; references 22: 11 Russian, 11 Western (1 in translation).
[270-6415]

UDC 621.382.681

CHOOSING INTEGRATED CIRCUITS FOR DEVICES FOR DIGITAL PROCESSING OF SIGNALS

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81
(manuscript received after completion 1 Jun 80) pp 22-31

LEBEDEV, V. I.

[Abstract] The results are presented of a study of the basic elements of integrated circuits used in such items as digital filters, analog-digital and digital-analog converters. Their use has expanded noticeably and relatively quickly. The number of types of integrated logical circuits is so-far large, so that it is not easy to select the proper circuits. In a footnote the author states that a 1980 Soviet handbook lists 327 types of microcitcuits united into 48 series of digital integrated circuits and 32 series of analog IC. In comparison, he continues, the handbook Digital Integrated Circuits: Data Book, 1978/79"evaluated more than 20 thousand digital microcircuits, including those effective and obsolete. The basic criteria of a choice of an elementary base, and a new generation of integrated circuits are discussed. A table presents the basic properties and parameters of promising integrated circuits, on the base of which microprocessors are developed. Figures 5; tables 2; references 10: 9 Russian, 1 Western in translation.
[325-6415]

UDC 681.142.67.001.3;621.382.33

CLASSIFYING STRUCTURES OF ACTIVE ELEMENTS OF BIPOLAR INTEGRATED MICROCIRCUITS

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81
(manuscript received 7 Sep 79) pp 268-279

LIBERMAN, F. Ya., Moscow Institute of Railway Transport Engineers

[Abstract] A system is presented for classification of bipolar functional-integrated active elements of integrated circuits. Three determining criteria are used as the basis of the classification: 1) Topology of structure; 2) Direction of principal interaction between junctions of structures--use of substrates as insulating layer or source of injection supply, and horizontal and vertical interaction between junctions as basic or parasitic; and 3) Functional integration--combination of functions of several active or passive elements of one region or p-n junction of structure. The classification of single-row structures of active elements of bipolar integrated circuits with p-substrates are listed in a lengthy table. It is found that the method of analysis of bipolar integrated circuits as systems of interacting p-n junctions makes it possible to obtain possible variations of elementary structures by a combinatorial search by exhaustion for a specified technological type of integrated circuit and to forecast by a guided search new forms and circuits of active elements. It can serve basically for development of topological-technological and functional elements and structures of integrated circuits. Figures 3; tables 1; references: 5 Russian.
[270-6415]

UDC 682.825

EMITTER-FUNCTION LOGIC SYSTEMS AS ELEMENTARY BASE FOR LARGE-SCALE INTEGRATION WITH MAXIMUM HIGH-SPEED RESPONSES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
No 3, Mar 81 (manuscript received 14 Sep 79) pp 18-26

MOZGOVOY, G. P.

[Abstract] As shown in the literature, circuits of emitter-function logic (EFL) realize the maximum high-speed response as compared with other types of components based on transistors. However, they are characterized by smaller functional possibilities as compared with emitter-coupled logic (ECL) circuits. The present paper analyzes characteristic EFL circuits and the areas of their most effective use are revealed. The following points are discussed: 1) Statistical characteristics; 2) Dynamic characteristics; 3) Logical possibilities of EFL circuits (single-stage and two-stage EFL); 4) Basic crystal of matrix type for realization of shift and register functions; and 5) Super-fast general-purpose counter-converter. It is shown that with respect to speed of operation EFL circuits surpass ECL circuits by 30 to 40%. Microcircuits of counters, dividers and registers can

be constructed on the basis of EFL circuits, as well as switching and shift large-scale integrated circuits, with a limit among bipolar microcircuits with a speed of operation $t_2 = (15 \div 30)$ nanosec and $f_{max} = (10 \div 14)$ GHz which approaches the theoretical limit for any electronic system $t_3 = (5 \div 10)$ nanosec. A procedure for engineering planning of EFL circuits has been developed. Figures 6; tables 2; references 11: 7 Russian, 4 Western (1 in translation).
[268-6415]

UDC 535.24:621.35

CALIBRATION MODULATOR OF LIGHT FLUX FOR CERTIFICATION OF TIME-MEASURING OPTOELECTRONIC DEVICES

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81 (manuscript received 16 Jul 80) pp 47-48

MAMON, V. L., IOANNISIAN, A. B. and KHLEBNIKOV, F. P.

[Abstract] A method is investigated and a device for modulation of light flux is developed, based on interruption of the optical contact with the use of a piezoceramic. Forming of calibrating light pulses for inspection of time-measuring optoelectronic devices is assured. The parameters of the light pulses which are formed by the test modulating device satisfy the calibrating requirements as regards the duration and amplitude of light pulses of the millisecond range. A block diagram of the modulating device and its technical specifications are presented. Figures 2; tables 1.
[298-6415]

UDC 535.81

OPTICAL SYSTEM FOR FOURIER RECORDING AND PROCESSING OF INFORMATION

Leningrad IZVESTIYA VYSSHIKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No 5, May 81 (manuscript received 3 Jan 79) pp 80-84

NIKOLOV, I. D.

[Abstract] The paper is concerned with a calculation of optical objectives and optical systems with a telecentric course of the principal beams, to be used for Fourier holographic recording of information with a high density and for reading and processing with minimum disturbance. An optimized optical system prepared by the author is presented and its operation explained. The construction of the Fourier objective is shown. The paper was recommended by the Department (Kafedra) of the Theory of Optical Instruments, Leningrad Institute of Precision Mechanics and Optics. Figures 3; references 8: 5 Russian, 3 Western (1 in translation).
[314-6415]

UDC 535.232.6:537.227

COORDINATE-SENSITIVE PYROELECTRIC RADIATION DETECTOR

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81
(manuscript received 15 Jan 80) pp 3-5

NOVIK, V. K., BEN'KOVICH, I. A., FEL'DMAN, N. B. and SMOLYA, A. V.

[Abstract] In the general case, transfer of information by a radiant flux can be performed by direct modulation of any of the parameters which characterize radiation. Various devices for this purpose are discussed in the present paper. It is shown that change of the temperature-dependent working parameter is the most practical way to realize spatial distribution. With respect to a number of technical and constructional procedures, the introduction of spatial distribution of temperature-dependent electrical parameters is justified only for pyroelectric radiation detectors. The principal analytical relations, the circuits of pyroelectric detectors and the results of experiments are investigated. The following points are illustrated: 1) Block diagram of transformation in two-coordinate pyroelectric detector with parallel passage of heat flow through elements of the detector; 2) Dependence of pyroelectric coefficient of the polarizing field for PKS ceramic; 3) Structural diagrams of coordinate pyroelectric detectors; and 4) Characteristics of one-coordinate pyroelectric detector. It is shown that error in determining coordinates can be reduced to 1% with the use of pyroactive ceramic with normalized distribution of properties.
[271-6415]

UDC 535.317.2

RELATIONSHIP BETWEEN ERGONOMIC AND PRECISION INDICATORS FOR GUIDANCE PROCESS IN OPTICAL DEVICES

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian
Vol 24, No 3, Mar 81 (manuscript received 29 Dec 79) pp 67-72

KNOROZ, I. V.

[Abstract] The case of the transverse guidance (setting) of a reference element in the visible range in the field of view of an optical instrument, corresponding to a specified guidance precision, is analyzed in order to ascertain the nature of the guidance processes with manual control and visual observation of their execution, and then to determine the relationship between the accuracy and ergonomic indicators. Random variations in the dynamic behavior of the system (friction inconstancy, the action of the operator) lead to a scatter in the actual settings of the reference element, i.e., make the guidance a probabilistic process. The subsequent probability analysis derives expressions which allow for the analytical solution of three problems for unilateral and bilateral guidance variants: 1) Determine the probability of guidance with a requisite precision for specified

ergonomic expenditures; 2) Determine the ergonomic expenditures for a specified precision and guidance probability; and 3) Determine the precision with which guidance can be executed when its probability and ergonomic expenditures are specified. A necessary initial step is the determination of the experimental differential laws governing the probability distributions. The proposed approach makes it possible sharply to curtail the volume of experimental studies of optical instruments and can be useful in evaluating the operational properties of optical devices during quality control. The paper was recommended by the Department (Kafedra) of Optoelectronic Devices, Leningrad Institute of Precision Mechanics and Optics. Figures 1; references 3: 2 Russian, 1 Western (in translation).
[282-8225]

UDC 535.513

POLARIZATION PROPERTIES OF CORNER REFLECTORS

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 (manuscript received 15 May 80) pp 9-12

KOROTAYEV, V. V. and PANKOV, E. D.

[Abstract] Corner reflectors (CR) are used in various optical devices, among them polarized devices. Some results of an analysis of the polarization properties of CR for complete internal reflections, experimental investigations of the polarized properties of prismatic CR with metallized faces, as well as CR with mirror faces, are shown in the literature. The present paper analyzes the polarization properties of all the above types of CR, their dependence on the materials employed and the length of the radiation wave. The parameters are calculated of the radiation reflected by CR of various types, as a function of the azimuth of the polarization of an incident linearly polarized beam. The average values of the reflection coefficient of CR are given in a table. It is shown that the polarization properties of a CR substantially depends on the material from which it is produced as well as on the form of the coatings applied to it, and has a more complex nature than has previously been asuumed. The variety of polarization properties of the different types of CR makes it possible to select a reflector with the properties required for solution of concrete problems. Figures 3; tables 1; references 8: 7 Russian, 1 Western.
[271-6415]

UDC 549.517.11:548.535

ANTIREFLECTING COATINGS FOR GLASSY CHALCOGENIDES IN THE VISIBLE AND INFRARED REGION OF THE SPECTRUM

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 (manuscript received 9 Aug 79) pp 34-37

FIRTSAK, Yu. Yu., MIGOLINETS, I. M., DOVGOSHEY, N. I., SMAGA, I. V., TARNAY, A. A. and SHKOBA, T. I.

[Abstract] This paper is concerned with selection of a film system and the development of procedures for depositing a two-layer antireflecting coating, use of which would be permitted for all antireflecting coatings for chalcogenides glass of the type Ge-As(Sb)-S(Se), and with an appropriate choice of thickness of the layers to decrease the reflection of the surface to a magnitude close to zero with any wavelength from the transmission region. The coating must have a low level of absorption, good adhesion to a substrate, high radiation strength, and does not interact with the environment. It is shown that use of coatings of the type $CaF_2/Ge_{24}As_{12}S_{64}$ make it possible to increase the transmission of glasses $Ge_{33}As_{12}S_{55}$, $Ge_{33}As_{12}Se_{55}$, $Ge_{28}Sb_{12}S_{60}$, $Ge_{28}Sb_{12}Se_{60}$ at wavelengths of 0.63, 1.15, 3.39, 5.25 and 10.6 micrometer, by 15-20% on the average. It is concluded that the type of coatings developed can be used successfully for a whole class of materials, the refraction index of which lies in the limits of 2.10-3.10. These materials can not only be chalcogenide glass of the systems Ge-As(Sb)-S(Se) for the antireflection of which the coatings described above were developed, but also a number of crystalline materials of infrared optics. The proposed coatings have good adhesion, mechanical strength, resistance to interaction with the environment and the effect of laser radiation. Figures 3; tables 1; references 19: 12 Russian, 7 Western.
[271-6415]

UDC 62-531

IMPROVING STABILITY OF THE STATIC CHARACTERISTIC OF AN OPTOELECTRONIC ANGULAR DEFLECTION SENSOR

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian Vol 24, No 3, Mar 81 (manuscript received 11 Mar 79) pp 82-85

ANDREYEV, A. L. and GUBIN, Yu. A.

[Abstract] The design of optoelectronic angular displacement sensors based on the amplitude-phase measurement of the coordinates of a shining mark image using a positionally sensitive photodiode encounters difficulties related to maintaining a constant static characteristic wherever factors act to produce a change in the illumination of the photodetector. This paper proposes a design for an optoelectronic angular deflection sensor in which the static characteristic is stabilized in the electronics through the stabilization of the composite signal picked

off of the positionally sensitive photodetector, by means of automatically controlling the power of the emitted pulses. A block diagram of the electronics of the sensor and light pulse generator is presented, and a detailed schematic is given for the automatic control channel for the emission pulse power. The active device complement of the latter includes 2 IC's, 4 bipolar transistors and an LED. The insertion of the output pulse power control circuitry significantly boosts the stability of the static characteristic: with a change in the output emission of the LED by a factor of 3 (which is possible with an ambient temperature change of from -40 to +40°C), the relative error in the measurement of the shining mark coordinates because of this, and thus the error in the angular deflection measurement, does not exceed 0.2%. The paper was recommended by the Department (Kafedra) of Optoelectronic Devices, Leningrad Institute of Precision Mechanics and Optics. Figures 3; references: 4 Russian.
[282-8225]

UDC 621.791.3:621.383.002.5

INCREASING RELIABILITY OF SOLDERED CONNECTIONS IN OPTOELECTRONIC UNITS

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81
(manuscript received 20 Dec 79) pp 40-41

LARIONOV, A. I. and SIBATOVA, N. S.

[Abstract] Soldering is performed at the authors' enterprise (not identified) by two methods: Contact-reactive and with the use of a soldering iron. The equipment for contact-reactive soldering is made according to plans developed by the enterprise and designed for small-scale production. Contact-reactive soldering does not require use of a flux--this is a hard solder which is one of its advantages because the problem of washing off the flux residue disappears. In addition, tinning of the leads of microcircuits and the contact surfaces of printed circuit boards before soldering is not required, which reduces the technological cycle. Other advantages are also listed. The results are given of a comparison of soldered connections made with a soldering iron and the contact-reactive method. Tests show that the reliability of connections obtained by the contact-reactive method is 1.5-2 times greater than connections made with a soldering iron. The special features are considered of technology which furthers an increase of reliability during 3-dimensional wiring. With the object of increasing the reliability of subassemblies of optoelectronic units and identifying the defects of radio elements caused by thermal shock during soldering and of hidden nonsoldered spots, the operations of thermal and electrical aging has been introduced. References: 1 Russian.
[298-6415]

UDC 666.1.056 + 620.197.2

FUNGICIDE COMPOUNDS AND COATINGS CREATED ON THEIR BASE FOR ALUMINIZED MIRRORS

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81
(manuscript received 20 Dec 79) pp 28-30

BAYGOZHIN, A., KUZNETSOVA, L. V., BELOVA, I. V., RODIONOVA, M. S. and
BEREZNIKOVSKAYA, L. V.

[Abstract] Aluminized mirrors are widely used in optical devices, including those operating under conditions of a moist tropical climate. Under these conditions aluminized mirrors on glass substrates with an external reflecting layer affected by moisture and microorganisms are damaged and their light-reflecting properties are reduced. Existing methods of protection of optical units of chemically resistant and nonresistant materials from the effect of the moist tropics are inadequate for protection of aluminized mirrors because of the breakdown of the aluminum level or reduction of the reflection coefficient of light by mirrors with known fungicide coatings. It is shown in the present paper that on the basis of a mixture of tetraethoxydtitanium and triethylmethacryloxystannan coverings are obtained which assure an increase of the moisture and fungus resistance of aluminized mirrors. Figures 2; tables 1; references 13: 10 Russian, 3 Western.
[271-6415]

UDC 681.7.064.45

AUTOMATING PROCESS OF DEPOSITION OF INTERFERENCE COATINGS ON OPTICAL UNITS

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81
(manuscript received 10 Mar 80) pp 30-33

ASTAKHOV, V. G., KHOMYAKOVA, F. T. and YURCHUK, A. I.

[Abstract] During series production of multilayer interference coatings by deposition in a vacuum, it is very important to assure reproductibility of the spectral characteristics from one deposition cycle to another. At, present, both in the USSR and abroad, two optical methods have obtained practical use for checking the optical thickness of interference coatings deposited in a vacuum: 1) By the magnitude of the transmission (or reflection) coefficient with a fixed wavelength of the emission being checked (extreme method); and 2) Checking based on modulation of the wavelength. The present paper shows the possibility of automatic checking of the process of deposition of multilayer interference coatings with films of an optical thickness equal to or a multiple of $\lambda/4$. During development of a model of a device for automatic deposition of the interference coating of a "cold light" mirror, the USSR-made KSP-4 electronic automatic potentiometer was taken as the most suitable unit

for automatic checking of the thickness of films. The KSP-4 assures a sensitivity of 10 mkV in all the threshold sensitivity scale. It has a high precision of fixation of the extremes of transmission (reflection). The error of optical thickness of the film is less than 1% of $\lambda/4$. Use of the checking system developed does not require modernization of series deposition equipment. Figures 4; references 9: 5 Russian, 1 Czech; 3 Western.
[271-6415]

OSCILLATORS, MODULATORS, GENERATORS

UDC 621.373.12

FREQUENCY STABILIZATION OF ENSEMBLE OF SELF-EXCITED OSCILLATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 28 Dec 78) pp 598-609

GRIGORASH, V. V.

[Abstract] The author proposes two variations of a circuit for stabilization of the frequency of an ensemble of intersynchronized self-excited oscillators and the specifics of their operation are disclosed. In the general case, an exterior resonator is directly connected with k self-excited oscillator ensembles which can be defined by considerations of a structural nature. Possible steady-state regimes of oscillations and their stability are considered for each of the two variations of the stabilization circuits; the effectiveness of the ensemble frequency is evaluated; the energy regime and the area of possible rearrangements are analyzed. In order to increase the frequency stability of the ensemble, a system of cascade frequency stabilization with the aid of a ladder network of exterior resistance-connected resonators is proposed. The work has a definite theoretical value because the problems analyzed in it as applied to ensembles of intersynchronized self-excited oscillators are practically not considered in the literature. The experimental part of the paper confirms the most important theoretical conclusions. Figures 7; references 11: 8 Russian, 3 Western.
[324-6415]

UDC 621.373.13:536.587

SURFACE ACOUSTIC WAVES OSCILLATOR USING INTEGRAL THERMOSTAT

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian
No 3, Mar 81 (manuscript received 17 Dec 79, after revision 10 Jul 80) pp 109-110

KANEV, B. N. and ROZHDESTVENSKIY, A. N.

[Abstract] The development of oscillators which are stable in a temperature range and have a surface acoustic wave (SAW) delay line is connected with the use of cuts of piezoelectric crystals with a temperature coefficient of frequency (TCF) close to zero. In addition, a reduction of the TCF of a SAW-oscillator is possible by thermostat control or temperature compensation. Although thermostat control makes it possible to obtain higher frequency stability, the presence of a number of shortcomings limits its use in small-size equipment. The present short communication presents the circuit of a SAW-oscillator with a temperature-controlled substrate. The circuit includes an interdigital transducer. In the oscillator the control circuit operates on the principle of automatic phase control (AFC) of an inroad. In order to increase the effectiveness of temperature stabilization of the interdigital transducer, the circuits of the AFC are positioned in the direction of a large temperature coefficient of delay. It is concluded that the evaluation made of the time lag of the electrotherm control circuit and an analysis of its operation supports the prospective construction of a microminiature thermostat control of a SAW-oscillator. Figures 3; references 3: 2 Russian, 1 Western.
[268-6415]

PHOTOELECTRIC PHENOMENA AND DEVICES, ELECTROLUMINESCENCE, ION DEVICES

UDC 621.383.001.5-12

CHOICE OF CLEAR APERTURE OF OPTICS OF PHOTODETECTOR OPERATING IN SUBSURFACE REGIME

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81
(manuscript received 4 Oct 78) pp 61-62

ALIMOVA, T. N., ZHELUDOK, V. V. and KOZLOV, V. D.

[Abstract] One of the most important problems of underwater optics is the investigation of radiation which penetrates into the depths of the water of seas and oceans. In this connection, the creation of detectors which make it possible to record very weak light fluxes in a subsurface regime with maximum effectiveness is of particular value. On the basis of a procedure for calculation of a subsurface body of luminance, the present brief communication presents an analysis of the effect of the clear aperture of the receiver optic of a photodetector operating in a subsurface regime on the magnitude of the light flux. Figures 2; references: 1 Russian.
[298-6415]

UDC 621.383.4.001.5

INVESTIGATING NONLINEAR DISTORTIONS OF PHOTORESISTORS IN LOW-FREQUENCY REGIONS

Kiev POLUPROVODNIKOVAYA TEKHNIKA I MIKROELEKTRONIKA in Russian No 32, 1980
(manuscript received 7 May 79) pp 3-7

BEZVENYUK, V. Ye., BOGDANOVICH, V. B. and SVECHNIKOV, S. V., Institute of Semiconductors, UkSSR Academy of Sciences, Kiev

[Abstract] During the operation of photoresistors in a-c circuits the quality of the photoresistors is characterized by the nonlinear distortions introduced by them. Presentation of the volt-ampere characteristics (VAC) in the form of a power series is ordinarily used in endeavors to calculate the coefficient of nonlinear distortions, K_N. In such a method of calculation, the VAC parameters are not connected with the physics of the passage of current through the

photoresistor which eliminates calculation of universality, i. e., the possibility of forecasting the magnitude K_N as a function of the parameters of a circuit, the level of the photoexcitation and the geometry of the photoresistor. A procedure is presented for calculation of K_N which is valid for a band of frequencies up to 1 Hz. In order to calculate K_N in higher frequency regions it is necessary to use a dynamic VAC. The dependences found make it possible qualitatively to show a method for choosing the design of a photoresistor and the procedure for obtaining low nonlinear distortions: a) For switching of analog signals it is necessary to select a photoresistor with small interelectrode separations; b) In controlled dividers it is advisable to use a photoresistor with large interelectrode separations and areas. Figures 3; references 8: 7 Russian, 1 Western.
[276-6415]

UDC 681.78.006.354.065

DETERMINING SPECTRAL CHARACTERISTICS OF NONLINEAR PHOTODETECTORS

Moscow IZMERITEL'NAYA TEKHNIKA in Russian No 4, Apr 81 pp 27-28

BORISOV, V. A., DOLGANIN, Yu. N. and KUCHERENKO, I. A.

[Abstract] A comparative evaluation is made of methods of measuring the spectral characteristics of nonlinear photodetectors. It is shown that the equisignal method of measurement of spectral sensitivity makes it possible to eliminate errors resulting from the nonlinearity of the energy characteristics of optical radiation detectors. A method is proposed for calculation of the expected reaction of a photodetector with a nonlinear energy characteristics to the radiation of a specified spectral composition and a specified power. Figures 3; references: 8 Russian.
[272-6415]

POWER SYSTEMS (INCLUDING EFFECT OF VARIOUS ITEMS ON POWER TRANSMISSION)

UDC 621.311.4:621.316.933.1

INVESTIGATING PROCESSES OF DEVELOPMENT OF LIGHTNING SURGES ON ELECTRICAL EQUIPMENT DURING PLACING OF PROTECTIVE GAPS ON APPROACHES TO SUBSTATION

Minsk IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: ENERGETIKA in Russian No 2,
Feb 81 (manuscript received 4 Sep 80) pp 19-24

KINASH, B. M., candidate of technical sciences, TIMOSHIK, N. I., student,
L'vov Order of Lenin Polytechnical Institute imeni Lenin Komsomol, and
SHEREMETA, Z. K., Production Power Association "L'vov Power"

[Abstract] The effect is shown of decreasing the actuation time of a protective gap and a reduction of the amplitude of lightning surges, on the equipment of a multifeeder substation with an increase of the space between the busbars of the distribution device and the location of the gap on the line. The effect mentioned is caused by the influence of a wave reflected from the substation on the actuation time of the protective gap. It is demonstrated that for 35-220 kV substations with two or more electrical transmission lines at a section or system of busbars, limitation of the amplitude of surges by protective gaps remote to the line is essential and the real possibility arises of using such gaps in lightning protective circuits. The paper was submitted by the Department (Kafedra) of Electrical Systems and Networks of the L'vov Order of Lenin Polytechnical Institute. Figures 4; tables 1; references: 2 Russian.
[269-6415]

UDC 621.316.8

LASER TREATMENT IN MANUFACTURE OF PRECISION GIS THIN-FILM RESISTORS

Moscow PRIBORY I SISTEMY UPRAVLENIYA in Russian No 3, Mar 81 pp 39-40

GOTRA, Z. Yu., candidate of technical sciences, and GOLDOVANSKIY, B. A., engineer

[Abstract] Laser fitting by heat treatment of thin-film resistors was investigated during development of precision analog integrated circuits and also of thin-film resistive dividers having the accuracy of thin-film resistors. Thin-film resistors based on RS3710 alloy were used for laser heat treatment. The resistor parameters were stabilized by annealing in air at 350°C for 3 hours. The resistors were heat treated by sequential irradiation of sections of the resistive film by laser pulses with emissivity of 1.6 kW, with pulse length of 10 nanoseconds and repetition rate up to 100 Hz. The variation of the temperature resistance coefficient during fitting by 5 percent did not exceed 2-4 percent of the initial value and was within an acceptable range. The relative time variation of resistance in the resistors was close to that of control resistors after 750 hours of storage in air. Laser heat treatment was used to produce 14-digit thin-film resistive dividers and digital-analog converters based on them. Figures 1; references: 1 Russian.
[283-6521]

UDC 621.383.44:658.526

IMPROVING TECHNOLOGICAL PROCESS FOR MASS PRODUCING CADMIUM SULFIDE PHOTOCONDUCTIVE CELLS

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81
(manuscript received 19 Apr 80) pp 35-38

KANISHCHEV, S. V., KRAKOVNAYA, N. N., KRAKOVNYY, A. A. and KURIKHIN, O. V.

[Abstract] The paper describes the positive results obtained by the authors in optimizing the production cycles in the mass manufacture of the photosensitive layers of FPF-9 cadmium sulfide photoconducting cells used in exposure meters and motion picture equipment. Block diagrams are presented of the original technological process for manufacturing photosensitive elements and the improved version. Figures 3; references: 3 Russian.
[298-6415]

PULSE TECHNIQUES

UDC 519.216

MEASURING MOMENTS OF POISSON PULSE RANDOM PROCESS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 18 Jun 79) pp 570-577

ZACHEPITSKAYA, L. P. and KLIBANOVA, I. M.

[Abstract] The authors consider differences in the behavior of simple and complex random processes, using as an example the classic problem of the measurement of the moments of random processes. In order to follow up the differences in the properties of simple and complex processes and to reduce the problem concerning measurement of moments to concrete results, it is necessary to know the analytical expression of higher cumulative functions. Consequently, in the present work the problem of measuring moments is considered for a model of Poisson pulse random processes, the expressions for the cumulative functions of which are known. It should be noted that the problem of measuring the moments of a Poisson random process has practical interest in addition to the theoretical, because such a model is described reasonably well by a whole series of physical processes and, in particular, reflection of a wave pulse from very small-scaled nonuniformities during radar sounding of space-nonuniform media. It is concluded that, in the case of simple random processes during measurement of moments of different orders, an equal averaging time is required, independent of the order of the moment, if equal requirements on the precision of measurement are imposed. In the process the precision is determined by the magnitude of the averaging interval in comparison with the correlation time of the process. For complex random processes, the averaging time required for determining with equal precision the moments of various orders can prove to be substantially different as a function of the order of the moment. This difference is determined in the first place by the difference of the extent of higher cumulative functions from the correlation time of the process, and secondly by the relative magnitude of the higher cumulative functions. In particular, for a Poisson random process, the extent of the higher cumulative function is determined (as a function of order), either by the duration of an elementary pulse or the correlation time. The relative magnitude of the cumulative functions is determined by the density of the pulse flow (λ). With a large density of flow of a Poisson random process, the relative magnitude of the higher cumulative functions proves to be so small that even with a large difference of the extent of higher cumulative functions from the correlation time, the

averaging time which assures measurement with the same precision of the moments of different order, proves to be identical. In this case the multidimensional distribution of the process is asymptotic Gaussian. The difference of the multidimensional distribution from the Gaussian is observed with a relatively small density of the pulse flow. In this case the averaging time of the moments of higher orders can substantially differ from the time of measurement, e. g., of the average value. In the process they are determined to a considerable degree by both the density of pulse flow and by the extent of the higher cumulative functions. The authors thank A. N. Malakhov, S. N. Gurbatov and A. I. Saichev for discussion and helpful council. References: 9 Russian.
[324-6415]

UDC 621.317.341

PARAMETRIC IDENTIFICATION OF PULSES DEVICES WITH LUMPED PARAMETERS

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 26 Jun 79, after revision 30 Apr 80) pp 63-68

VVEDENSKIY, Yu. V. and YAKOVLEV, G. L.

[Abstract] In order to determine the parameters of the elements of an equivalent circuit of pulse devices, it is possible to use picosecond pulse generators and stroboscopic oscillographs which at present assure generation and observation of pulse signals with a duration of less than 10^{-10} second. The pulse nature of the reactance of the circuit in question, connected with the transmission, makes it possible with such a procedure to eliminate the effect of nonuniformities interfering with the measurement (e.g., loads). The present paper describes how, in an experimental investigation of the measuring procedure, modelling of a circuit of the third order with one input and output was achieved on a computer. A signal-to-noise ratio on the order of 500 gave an error in determining the parameters of the circuit of not more than 20%. Figures 4; references: 4 Russian.
[268-6415]

UDC 621.383.292

CHANGE OF FORM OF FEU-83 SINGLE-ELECTRON DISTRIBUTION OF PULSES DURING MEASUREMENTS IN WIDE SPECTRAL RANGE

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 1, Jan 81 (manuscript received 4 Mar 80) pp 61-62

VETOKHIN, S. S. and GULAKOV, I. R.

[Abstract] It is shown that under the conditions of cooling to a temperature of -20 to -40°C, FEU-83 photomultipliers have characteristics which indicate their

suitability for use in photon counters. One of the most important parameters of the FEU is the amplitude distribution of the output pulses (ADP). Because a change of temperature of the FEU-83 effects the intensity of the exponential branch of the ADP, and by the dissectors also the amplitude of single-electron pulses, during transition from one wavelength of the illumination to another over a wide range of spectral sensitivities of the FEU-83 (350 to 1200 nanometer) the form of the ADP is noticeably disturbed, particularly in the 350-600 nanometer band. Figures 3; references 21: 17 Russian, 4 Western.
[271-6415]

UDC 621.373.826

SMALL-SIZED SINGLE-MODE CARBON DIOXIDE LASER

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 19 Jul 79) pp 610-616

KUZYAKOV, B. A. and KHOR'KOV, V. F.

[Abstract] The design is described of a compact waveguide CO_2 laser with a 2-section cylindrical discharge tube with an interior diameter of 2 mm and 120 mm long, made of BeO ceramic. The experimental characteristics of the output emission of a waveguide CO_2 laser are compared with the calculated relationships. The dependence of the output power of a 4-component mixture of the gases $Xe:CO_2:N_2:He$ on the intensity of pumping is experimentally measured. The measured radial distribution of the intensity of emission in the far zone is satisfactorily explained by the Gaussian law. It is experimentally established that the waveguide resonator is less critical to the alignment of reflectors as compared with the Fabry-Perot resonator. The optimum modes of a waveguide CO_2 laser and the values of the optimum transmission of the output mirror with different levels of losses in the resonator are determined. An analytical expression is derived for calculation of the generation power of the waveguide laser in a dynamic mode with losses in the resonator taken into account. The experimental results obtained are compared with those calculated. The authors thank M. Ye. Zhabotinskiy and V. V. Grigor'yants for helpful council and discussion of the results of the work. Figures 5; tables 1; references 11: 7 Russian, 4 Western.
[324-6415]

UDC 778.38

CORNER GENETIC FUNCTIONS FOR SYNTHESIZING CONTOUR IMAGES AT OUTPUT OF HOLOGRAPHIC CORRELATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 9 Apr 80) pp 592-597

GINZBURG, V. M. and LEVITOV, Ye. B.

[Abstract] The results are presented of experimental investigations of the out-of-focus images of contour corner genetic functions of types "Ugolka" [angle] and "Perekrest'ye" [cross] proposed for synthesis at the output of a correlator of stylized images of objects shown at the output of a correlator. Transparencies in the form of a transparent sharp image of functions on a black background were used as specimens. On all the transparencies, the thickness of the lines equals $\alpha = 0.25$ mm. The size of the images is as follows: length of cuts of Ugolka and Perekrest'ye $b = 7$ mm; angular aperture $\beta = 60°$; angles of Perekrest'ye equal 120°. The investigations were made on an UIG-2m installation, a plan of which is presented and explained. The optimum defocusing for production of the spatial filters of a correlator was determined. This proved to be equal to the average defocusing of the eye (approximately 0.2 diopters). Figures 7; references: 8 Russian.
[324-6415]

UDC 621.396.96

REALIZING SUBSURFACE SOUNDING OF STRATIFIED EARTH COVERS USING COHERENT RADAR WITH DOPPLER FILTRATION

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 9 Apr 80) pp 560-569

GLOTOV, V. P., KUTEV, V. A. and FINKEL'SHTEYN, M. I.

[Abstract] As a rule practical realization of radar methods of subsurface sounding is connected with a transition to the meter range of radio waves and the use in this range of wide-band sounding signals, which contain a small (in the limit of one) number of periods of carrier frequency. The most convenient method of forming such signals is the impulse excitation of wide-band antennas by video pulses of nanosecond duration. This method was used by the authors in the experimental operations described in the paper in connection with sounding from an aircraft of sandy soil and frozen rocks. Wide-band airborne antennas of the meter range of radio waves are characterized by low directivity. As a result of this there are appreciable difficulties in interpreting the results of sounding because of reflections from the irregularities of the earth's surface or other targets of artificial or natural origin. A decrease of the effect of these reflections can be assured by the use of special methods of processing the reflected signals, one of which is considered in the present work. The radar profile of the surface and the equivalent narrowing of the directional diagram of the antenna with the aid of Doppler filtration are considered. It is concluded that the possibility of practical use in the range of meter waves of the radar impulse method for subsurface sounding of frozen ground at a depth of 3-10 m has been experimentally demonstrated. Use of coherent processing of reflected signals with filtration of zero Doppler frequencies substantially increases the information content of the results of radar subsurface sounding of stratified earth covers from aircraft. Use of two flight elevations during fulfillment of the experimental work made it possible to separate out information concerning the subsurface structure of the medium being sounded on a background of false echoes from unevenness of the surface. The results of a full-scale experiment are indicative of the promising use of the method described for subsurface sounding during the solution of engineering and geological problems. Figures 8; references: 6 Russian.
[324-6415]

UDC 621.396.67

STATISTICAL CHARACTERISTICS OF FIELD DISPERSED BY DISTRIBUTED OBJECTS TO NEARBY RADAR

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 3 Dev 79) pp 99-101

SHELUKHIN, O. I.

[Abstract] In the case of detection of closely arranged objects in the limits of a fixed area with the aid of a radar it is necessary to take their extent into account. Combinations of "bright points," the position of which is determinate or random in space, can serve as models which characterize the reflection of an electromagnetic field from such objects. The present paper is concerned with determining the statistical characteristics of a noise signal dispersed by such extended objects and represented by bright points. Expressions are derived which make it possible to determine the correlation function of a field re-emitted by an extended object, which is represented by a combination of bright points, in the case of a stochastic nature of the probing signal with the curvature of the front of the incident wave taken into account. References: 3 Russian.
[268-6415]

RECORDERS

UDC 534.852

THREE-DIMENSIONAL RECORDING FIELD AND FRINGE EFFECT OF MAGNETIC HEAD

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81
(manuscript received after completion 22 Sep 80) pp 31-34

RYLESHNIKOV, G. M.

[Abstract] During an investigation of multitrack recording, a new problem appeared: study of the recording field at the edge of the head. Under the assumption that the field of the head was primarily plane-parallel, its bend was calculated in one paper at each of the four corners of the operating gap. In subsequent works, with the object of simplification, calculation of the bend of the plane-parallel field was conducted for only one corner of the gap. Meanwhile, an experiment performed with the aid of a special magnetic powder demonstrated that the static recording field of a real magnetic head noticeably differs from the plane-parallel and in much depends on the type of pole tips. For that reason they are now made in one piece from ferrite or composed of plates with clearance. Consequently, any assumption concerning the plane-parallel recording field of a magnetic head is approximate and can lead to inaccurate results. These differences are shown as well as how the fringe effect of the head changes as a function of the cross section of one piece pole tips. At the basis of the proposed calcualtion lies the transformation of a plane-parallel field into a 3-dimensional field, and the determination of the profile of the latter in the central plane of the operating gap which is arranged perpendicular to the lines of force. Two models are used of a head with identical widths of the operating gap. In the first model the pole tips have a cross section in the form of a half-plane, and the second model in the form of a rectangle. Figures 5; references 5: 4 Russian, 1 Western.
[325-6415]

UDC 621.382.2:53.087.5

CARBIDE-SILICON LIGHT-EMITTING DIODES IN PHOTORECORDING DEVICES

Leningrad OPTIKO-MEKHANICHESKAYA PROMYSHLENNOST' in Russian No 4, Apr 81
(manuscript received 3 Jun 79) pp 41-45

ALTAYSKIY, Yu. M., AVRAMENKO, S. F., GORIN, S. N., KISELEV, V. S.,
MINEYEV, Ye. N. [deceased] and NIKITINA, V. P.

[Abstract] The object of this paper is to acquaint a large circle of specialists with the principal parameters, the especial features of operation, the construction and the potentialities of use of green-glow light-emitting diodes of cubic silicon carbide--3C-SiC. These diodes were created and produced at the Kiev Polytechnical Institute. Because they have large luminosity and pure color, increased resistance to temperature and current overloads, a wide range of operating temperatures, a long lifetime and long-term stability, such light-emitting diodes can successfully compete with widely known devices based on GaP and triple compounds. A photorecording device based on this light-emitting device is considered and its field of application is indicated. Figures 6; tables 1; references: 6 Russian.
[298-6415]

SEMICONDUCTORS AND DIELECTRICS, CRYSTALS IN GENERAL

UDC 539.216.2

PROCESS OF FORMING THIN-FILM SYSTEM METAL-DIELECTRIC-METAL

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 15 Oct 79) pp 655-656

VOROB'YEV, G. A.

[Abstract] In the thin-film system metal-dielectric-metal (MDM-system) with a thickness of the dielectric ordinarily less than 100 nanometer, with some aging under voltage, a number of significant changes take place, e.g., a strong increase of the current with the appearance of a N-shaped section on the volt-ampere characteristics, the appearance of electron emission in a vacuum and electroluminescence. This phenomenon of transformation of a MDM-system as though from a passive state into active received the name "forming." If the indicated characteristics of forming a MDM-system are studied sufficiently thoroughly, it is obvious that the nature of the process of forming has remained thoroughly obscure for some time past. At best, which was shown and understood, is the fact that forming takes place only at separate points on the area of a cathode. On the basis of data concerned with investigation of the system metal-oxynitride of silicon-Al in this short communication the author sums up a definite presentation concerning the forming process the statement of which can be useful for further study of this interesting phenomenon. A list of proposed specific investigations concerned with the mechanism of forming is presented. Figures 1; references 14: 9 Russian, 5 Western (in translation).
[324-6415]

UDC 539.216.22:537.311

MECHANISMS OF CONDUCTIVITY OF SILICON NITRIDE IN METAL-INSULATOR-SEMICONDUCTOR STRUCTURES

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81
(manuscript received 2 Apr 80) pp 227-234

VOLKOV, S. A. and OVSYUK, V. N., Institute of Semiconductor Physics,
Siberian Department, USSR Academy of Sciences

[Abstract] The results are presented of an investigation of the conductivity of layers of Si_3N_4 in germanium metal-insulator-semiconductor (MIS) structures obtained by the reaction of the fusion of silane (SiH_4) and ammonia at 700°C. A more detailed analysis is given of a quasi-stationary build-up of the charge of states, uniformly distributed with respect to the volume of the insulator. The conditions are determined of an imitation of the current-voltage characteristics of the insulator by the field dependence of the emission of charge carriers with the states in the allowed band of the insulation. The possibility is shown of the appearance of tunnel emission from the states with barrier transparency. A new model is proposed for explanation of certain properties of Si_3N_4. A model of charge accumulation in an insulator is proposed, which gives rise to a time dependence $j \sim t^{-n}$ where n can be a smaller unit and decreases with an increase of the field intensity in the insulation. In this case the conductivity of the insulation must be determined by the local sections at the interface with a contact with increased concentration of states. It is concluded that the investigation made of the layers of Si_3N_4 shows that the behavior of these structures is qualitatively similar to that observed earlier on MIS structures. Figures 4; references 15: 5 Russian, 10 Western (2 in translation).
[270-6415]

UDC 621.314.26

GUNN DIODE MICROWAVE MIXER

Moscow RADIOTEKHNIKA in Russian No 4, Apr 81 (manuscript received 25 Jun 80)
pp 9-22

KUKUSHKIN, V. V. and SOLYAKOV, V. N.

[Abstract] The results are presented of theoretical and experimental investigations of Gunn diode mixers with frequency conversion upward as source of microwave oscillations. The following points are considered in detail: 1) Conditions for realization of uniform distribution of a field in the active volume of a diode; 2) Method of calculation of the characteristics of mixers with large signal levels; 3) Mixer shift at first harmonic of conductivity; 4) Mixers at even harmonics of conductivity; and 5) Mixers at even harmonics of conductivity with frequency conversion upwards. A long list of conclusions to the paper is shown. The authors thank

Yu. V. Gulyayev, S. G. Kalashnikov and N. Ye. Skvortsova for constant attention to the work, and A. A. Aver'yanov, V. S. Lukash, L. P. Lyuze, A. V. Rodionov, V. I. Chikina, V. I. Golochkin and V. V. Shumayev for participation in investigation of mixer shift and for helpful discussions. Figures 9; references 35: 18 Russian, 17 Western (2 in translation).
[325-6415]

UDC 621.315.592

FEATURES OF LASER ANNEALING IN ION-IMPLANTED SPECIMENS OF SILICON WITH EFFECT OF CONDITIONS ON SURFACE

Kiev POLUPROVODNIKOVAYA TEKHNIKA I MIKROELEKTRONIKA in Russian No 32, 1980
(manuscript received 23 Jul 79) pp 22-28

GAVRILENKO, V. I., LITOVCHENKO, V. G., POPOV, V. G. and ROMANYUK, B. N., Institute of Semiconductors, UkSSR Academy of Sciences, Kiev

[Abstract] A complex investigation of laser annealing of ion-implanted Si is conducted by the methods of electroreflection, photoconductivity, scanning electron and optical microscopes, decoration by molecular crystals with the use of a procedure developed in 1978 by three of the authors, and x-ray topography. Investigations are made of structures based on n- and p-Si, implanted by phosphorous ions with energies of 100 kev with a dose of $6\cdot10^{15}cm^{-2}$. The laser annealing was produced by a ruby laser with a pulse duration of 35 nanosec in a monopulse mode. The energy in the pulse varied from 0.1 to 1.5 Joule/cm^2. In addition to specimens implanted by P^{31} ions, specimens of Si with a natural surface were investigated, as well as Si processed in an argon plasma with an accelerating field of 500 V/cm with a dose on the order of $10^{16}cm^{-2}$. Figures 4; references 24: 13 Russian, 11 Western.
[276-6415]

UDC 621.373.5.029.64

MEASURING PHASE STABILITY OF RADIO PULSE GUNN-DIODE OSCILLATORS

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 15 Oct 79) pp 664-666

VVEDENSKIY, Yu. V. and SYUVATKIN, V. S.

[Abstract] A method of measuring the phase stability of radio pulse Gunn-diode oscillators is explained. The upper evaluation of phase instability experimentally obtained by this method does not exceed 4° at a frequency of 7 GHz and 5° at a frequency of 9.2 GHz which is equivalent to a time of instability of radio pulses relative to the triggering moment and relative to each other of 1.6 nanosec. A

photograph is presented of a Lissajous figure observed on the screen of a stroboscopic oscillograph during measurement of the phase stability of independent Gunn-diode oscillators at frequencies of 7.0 and 7.7 GHz. The time interval of observation in obtaining oscillograms can be shifted within the limits 0-20 nanosec. The results of the experiments confirm that oscillators based on semiconductors with volumetric instability make it possible to obtain coherent radio pulse signals of nanosecond duration, which can find an application in various radio engineering systems. Figures 1; references: 3 Russian.
[324-6415]

UDC 621.382

MODEL OF METAL INSULATED GATE FIELD EFFECT TRANSISTOR WITH BULK CHANNEL

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81 (manuscript received 14 Jan 80) pp 214-226

SKORIKOV, V. A., ZELENTSOV, A. V. and PADERIN, A. Yu.

[Abstract] The model presented of a metal insulated gate field-effect transistor (IGFET) with a bulk channel (BC), developed with the use of model representations regarding the operation of other types of field-effect bulk channels, describes the operation of the device with sufficient precision. The following points are considered: 1) Model of IGFET-BC; 2) Basic assumptions of theory; 3) Steep section of pentode field effect characteristics; 4) Regime of channel blocking; 5) Mildly sloping section; and 6) Triode Regime (reverse branch of current-voltage characteristics [CVC]). Simpler and clearer equations are derived for the steep section of the CVC in the enhancement and depletion modes. A solution is first obtained for the mildly-sloping section of the straight-line branch of the CVC of an IGFET BC. Representation of equations in terms of the differences of the potentials of the gate, drain and source makes it possible to obtain both straight-line (pentode) and reverse (triode) branches of the CVC. The first model considered of a device blocked at the gate deepens and expands the physical representation concerning the operation of the IGFET BC, sets up a connection between the pentode and straight-line triode operating condition, makes it possible to evaluate the threshold voltage at the drain triggering the device, sets up a connection between V_{drain} and the ratio of the length of the channel to its depth, and makes it possible to draw an analogy between the operation of IGFET BC and a new device-transistor with static induction (base of a unit of injection-field logic). The results of the calculations agree well with experiment. Figures 5; references 17: 3 Russian, 14 Western.
[270-6415]

UDC 621.382

CHARGE STATE OF DIELECTRIC IN STRUCTURE GALLIUM ARSENIDE--ANODE OXIDE

Moscow MIKROELEKTRONIKA in Russian No 3, May-Jun 81
(manuscript received 1 Nov 79) pp 250-252

TIKHOV, S. V., BEDNYY, B. I., KARPOVICH, I. A. and MARTYNOV, V. V.,
Gor'kiy Physico-Technical Institute

[Abstract] Anode oxide is a promising substance for passivation of the surface and the construction of metal-oxide-semiconductor (MOS) devices based on GaAs. The present paper investigates the dependence of the work of the output and surface photo-emf on the thickness of the film of dielectric in the structure GaAs--Anode oxide. This makes it possible to determine the magnitude and location of the localized charge in the oxide. The work of the output and surface-emf was measured by the dynamic capacitor method. The static current-voltage characteristics of the MOS structure Al-AO-GaAs were also measured. It is concluded that the linear dependence of the output work on the thickness of the anode oxide, which is observed in GaAs--Anode oxide structures over a wide range of thickness, indicates that the anode oxide is electrically uniform in spite of the chemical nonuniformity of its composition with respect to thickness. Figures 2; references 9: 2 Russian, 7 Western.
[270-6415]

UDC 621.382.029.64

FREQUENCY PROPERTIES OF GUNN-DIODE MIXERS IN MILLIMETER BAND

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 31 Oct 79) pp 666-667

BULAKHOVA, L. V., KUKUSHKIN, V. V. and SOLYAKOV, V. N.

[Abstract] It is known from the literature that in the case of a frequency of microwave voltage corresponding to the millimeter band (f > 30 GHz), redistribution of electrons among valleys in n-GaS, which leads to nonlinearity of the dependence of current on the voltage, does not have time to move towards a field. As this takes place a hysteresis dependence of the current on the voltage appears (in contrast to the one-valued used in a 1976 study by Kukushin and Solyakov for calculation of the parameters of mixers). In the present short communication a modified temperature model of the conductivity of n-GaAs is used for determination of the current through a diode with the effect on it of microwave oscillations of the heterodyne and signal. This model agrees well with other more precise, but more complex theoretical models, and with the results of experimental investigations. In other respects the method of calculation agrees with the Kukushin-Solyakov study mentioned above. The results are presented of a calculation of the parameters of mixers with a frequency conversion without a direct bias voltage

(V = 0). Curves are shown: 1) of the dependence of conversion losses on the frequency of the signal; and 2) Dependence of conversion losses of the heterodyne power of the output signal on the output frequency. Figures 4; references 5: 1 Russian, 4 Western.
[324-6415]

UDC 621.382.82.001

CHOICE OF INITIAL APPROXIMATION TO NUMERICAL ANALYSIS OF BIPOLAR SEMICONDUCTOR DEVICES

Kiev IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: RADIOELEKTRONIKA in Russian No 3, Mar 81 (manuscript received 6 Dec 79, after completion 17 Apr 80) pp 49-56

MULYARCHIK, S. G. and ABRAMOV, I. I.

[Abstract] In present-day practice, planning of semiconductor devices more and more makes use of a computing experiment based on a numerical solution of continuity equations for holes and electrons, and a Poisson equation. However, in so doing expenditures of machine time prove to be too large. Various methods for reducing this expenditure are briefly described in the present paper. The authors then propose a method of search for an initial approximation for the problem of analysis of semiconductor devices by means of a numerical solution of a fundamental system of equations. The effectiveness of the method is illustrated by a solution of a two-dimensional analysis of bipolar transistors with the aid of a Gummel algorithm. The two-dimensional analysis called "COTDAG" was realized in FORTRAN-IV language on a unified system computer (memory volume--200 kBit). It is demonstrated that the convergence of the Gummel algorithm from the developed initial approximation with low and middle levels of injection turns into "a type of quadratic." Figures 4; tables 1; references 20: 5 Russian, 15 Western (1 in translation).
[268-6415]

UDC 621.791.3(083)

GROUP METHOD OF PRODUCING DIODE STRUCTURES

Kiev POLUPROVODNIKOVAYA TEKHNIKA I MIKROELEKTRONIKA in Russian No 32, 1980 (manuscript received 6 Jul 79) pp 76-80

GROSHEV, I. N., KROLEVETS, I. A. and OVCHINNIKOV, Yu. V.

[Abstract] A procedure is described for production of diode structures with dimensions of 0.7 x 0.8 x 0.9 mm^3 which comprise two series-connected silicon p-i-n diodes. According to the conditions of employment, the required precision of fulfillment of the geometrical dimensions of 0.7 and 0.9 mm amounted to 2-3

micrometers. In this case the procedures used in electronic technique methods of individual connection of individual p-i-n diodes into a structure could not assure the necessary precision and reproductibility of the geometrical dimensions. A group method of creation of the diode structures was developed, at the basis of which lies a joining together of the original alloyed silicon plates with subsequent group separation into individual diodes. The principal difficulty was obtaining high-grade soldering of the plates because of their relatively large dimensions. A detailed account is given of the experimental procedure and preparation of specimens. It is concluded that the group method developed for production of diode structures can effectively be used in manufacturing microwave diodes. Figures 3; references: 2 Russian.
[276-6415]

VARIOUS MISCELLANEOUS ITEMS, INCLUDING THEORIES

UDC 519.2:621.391

PROBABILITIES OF DISCRIMINATION ERRORS OF TWO PROCESSES WITH RANDOM INTENSITIES

Moscow RADIOTEKHNIKA I ELEKTRONIKA in Russian No 3, Mar 81
(manuscript received 27 Nov 79) pp 578-587

KOZIN, I. V.

[Abstract] Expressions are derived for the probabilities of error as applied to the Bayes' procedure constructed in a paper by the present author (I. V. Kozin, RADIOTEKHNIKA I ELEKTRONIKA, 1979, 24,9,1748) for discrimination of two processes with nonorthogonal distribution of probabilities. The following concepts are examined: 1) Subsidiary correlation; 2) Probability of error of the second type; 3) Probability of error of the first type; and 4) Special case. References 6: 5 Russian, 1 Western in translation.
[324-6415]

CSO: 1860 - END -

END OF
FICHE
DATE FILMED
23 Sept 1981